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ABSTRACT

This document presents the first of several follow-up studies on the longitudinal effects and costs of providing alternative types of early intervention services to children with disabilities. The nine studies being followed focused on either variations in program intensity, variations in the age of beginning intervention, or variations in program type. The studies were done with various subgroups of children with disabilities (e.g., visually impaired, hearing impaired, severely disabled, etc.). The bulk of this report consists of individual reports for each of the nine studies. For each study, information is presented about the alternative forms of intervention being examined and the outcomes for the various measures of child and family functioning. The following studies are presented: (1) New Orleans (Louisiana) Visually Impaired Project; (2) South Metropolitan Association/Lake McHenry (Illinois) Project; (3) Arkansas Intensity Study; (4) Jordan (Utah) School District; (5) Salt Lake City (Utah) Medically Fragile Project; (6) Charleston (South Carolina) Periventricular-Intraventricular Hemorrhage Project; (7) Columbus (Ohio) Medically Fragile Project; (8) Des Moines (Iowa) Public Schools; and (9) Utah Parent Involvement 1986. (DB)

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ANNUAL REPORT FOR PROJECT PERIOD
OCTOBER 1, 1990 - SEPTEMBER 30, 1991

of the

Longitudinal Studies of the Effects of Alternative Types of Early Intervention for Children with Disabilities

Submitted to the

U.S. Department of Education

by the

Early Intervention Research Institute

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Utah State University

October, 1991

EC 300883

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PREFACE

This document contains the first annual report of the ***Longitudinal Studies of the Effects of Alternative Types of Early Intervention for Children with Disabilities.*** This study is a follow-up of research that was conducted from 1985 to 1990 by the Early Intervention Research Institute (EIRI) at Utah State University as a part of a contract (Contract #300-85-0173) with the United States Department of Education. Funding for that project was provided by the U. S. Department of Education as well as the National Institute of Child Health and Human Development and the Office of Maternal and Child Health of the Public Health Service. The original project on which this follow-up research is based began enrolling subjects in 17 different studies in October of 1986. Data were collected for subjects in those 17 studies through the Fall of 1990. At that time, another contract was funded by the Department of Education (Contract #HS90010001) to continue data collection for 9 of the original 17 studies for an additional 3 to 5 years.

Because data collection as a part of the follow-up studies will continue through at least 1993, the data, results, and tentative conclusions contained in this report should be viewed as preliminary. Additional data are being collected, and analyses continue. Furthermore, even though care has been taken to discover key punching, transcription, and computational errors, it is certain that not all such errors have been identified and corrected at this time. As work continues, more up-to-date information on any study reported in this document will be available from the Early Intervention Research Institute.

Staff members contributing to sections of this report included: Glenna Boyce, Diane Behl, Glendon Casto, Linda Goetze, Nanette Gutshall, Mark Innocenti, Chuck Lowitzer, Stacey McLinden, Lance Mortensen, Matthew Taylor, and Karl White. Preparation of the report was done by Mary Ellen Heiner and Vicki Anderson.

BACKGROUND

In the Fall of 1985, the U. S. Department of Education undertook a significant initiative to investigate the longitudinal effects and costs of providing alternative types of early intervention services to children with disabilities. Through a competitively awarded contract to the Early Intervention Research Institute at Utah State University, planning was undertaken for a series of longitudinal studies.

The impetus for this type of a large scale research project stems from at least three sources. First, over the past 25 years, hundreds of research studies have been conducted to investigate the efficacy of early intervention programs for children who are disabled, disadvantaged, or at-risk. Unfortunately, much of this research has suffered from serious methodological flaws, narrow definition of outcomes, and/or inadequately implemented interventions (Dunst & Rheingrover, 1981; Simeonsson, Cooper, & Scheiner, 1982). Most of the research which has been well done, has been done with disadvantaged children, and there are questions about the degree to which findings from research with such children should be used to make decisions about programs for children with disabilities (White & Casto, 1985). Unfortunately, there is very little credible research data which can be used to draw conclusions about what types of early intervention programs are best for which children with disabilities.

Second, during the last 20 years, there has been a dramatic increase in the availability of early intervention programs for children with disabilities. This expansion is expected to continue and even increase with the 1986 passage of Public Law 99-457 which provides significant initiatives for states to mandate early intervention programs for children with disabilities by the Fall of 1991. Although much progress has been made, it is evident that the lack of high-quality research for children with disabilities has been a substantial impediment to improving the quality of early intervention services for such children and their families.

Furthermore, the rapid and continuing expansion has increased the need for better information about which early intervention programs are best for which children.

Third, during the last decade, resources for providing human service programs have become increasingly limited. This has led policy makers and program administrators to be more concerned about the costs as well as the effects of all human service programs. With regard to early intervention, there have been increasingly frequent questions about which types of programs are most cost-effective. Unfortunately, very little previous early intervention research has included a cost analysis component.

It was in the context of these three factors: 1) limited high-quality early intervention research for children with disabilities, 2) pressures to expand early intervention programs for children with disabilities, and 3) the almost total absence of efficacy research which includes a cost-analysis component, that the U. S. Department of Education issued a Request for Proposals (RFP) in the Spring of 1985. This RFP called for a contractor to conduct a series of experimental studies investigating the effects and costs of alternative types of early intervention for children with disabilities. The RFP stipulated that each of those studies must be a randomized experiment in which two alternative types of intervention were compared, must consider the effects of the intervention for both children and families, must analyze the costs in conjunction with the effects of the alternative types of intervention, and must be carried out in field-based settings which were representative of state-of-the-art early intervention programs.

The RFP required that one group of studies would investigate the effects of varying the intensity of the intervention program, another series would investigate variations in the age at which the comprehensive intervention program began, and a final group of studies would investigate the effects of program variation. These studies were to be done with various subgroups of children with disabilities (e.g., visually impaired, hearing impaired, severely disabled, etc.) instead of with disadvantaged or at-risk children. The contract provided funding for a 5-year period so that the effects of intervention could be assessed longitudinally, but the money was limited to actually conducting the research and was not to be used to fund the intervention programs.

Specifications for the contract required a series of feasibility studies during the first year (1985-86), after which the government would decide whether it would proceed with all or part of the proposed research workscope. Based on the work done during that first year (1985-86), the government decided to proceed with all of the work outlined in the original RFP. (A report of that work can be found in ERIC Document Reproduction Services #ED 293240 As a result of the government's decision, the ***Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children*** were initiated in October of 1986 and continued through December 31, 1990. A subsequent, competitively awarded, contract was then initiated (Contract #HS90010001) to continue to collect data for 9 of the original 17 studies so that the long-term effects of early intervention for children with disabilities could be more completely assessed.

The purpose of this report is to summarize the activities and results of research during the first year of the follow-up research for the ***Longitudinal Studies of the Effects of Alternative Types of Early Intervention for Children with Disabilities.*** The design and results of each individual study will be discussed.

During the 1990-91 year, individual site coordinators continued to make periodic site visits and regular telephone contacts with each of the sites. Site coordinators supervised the collection of treatment verification and outcome data at each of the sites. Because of turnover in diagnosticians, it was necessary to continue to train a few diagnosticians. Monitoring procedures were continued to ensure high-quality assessments. Management of the experimental comparisons at each of the sites required ongoing attention to make sure that appropriate data were collected and that the implementation of alternative interventions were continuing as planned. The early intervention programs in a number of the sites were no longer operational for children participating in the research since these children had "graduated" into public school programs. Arrangements were made to continue to follow those children and collect data annually. As outcome data were collected, site coordinators were responsible for cleaning, double checking, and entering the data into the computer for subsequent analyses.

The important task of minimizing attrition among participating child and families continued as a major responsibility of site coordinators. Children who had completed early intervention programs and moved to other parts of the country were located whenever possible and tested at appropriate times. In other cases, children had moved within the same geographic area and had to be relocated before testing could be done. In most sites, the efforts to relocate children have been successful, and the posttest data included in this final report often includes more children than the posttest data from the 1988-89 year. Unfortunately, a number of parents have simply lost interest in the project and declined to participate in spite of our best efforts to persuade them to continue. The importance of having liaison people located at each of the sites has been emphasized in this process.

The training of graduate students and their involvement in the **Longitudinal Studies** continued as an important part of the contractual workscope for the project. During 1990-91, 12 different graduate students from special education, family and human development, economics, and psychology were actively involved in the workscope of the **Longitudinal Studies.** Their responsibilities included supervision of data collection and coding, telephone interviews with parents, data analysis and interpretation, and report writing. In addition to these students who were employed an average of 20 hours per week, many additional graduate students from Utah State University and other universities were trained and certified to do educational assessments as a part of the **Longitudinal Studies'** workscope. These students were paid according to the number of assessments they completed.

The activities of the staff regarding dissemination of project results also increased. As more data has been collected, the results of these studies have been presented at national meetings and submitted to journals for publication.

The bulk of this report contains individual reports for each of the nine studies included in this project. Before presenting those detailed reports, a summary of the design and results of each study is presented. The following pages describe the most critical information about the design of each study and graphically summarizes the results for child and family outcomes. These tabular and graphical representatives are best interpreted in conjunction with the remainder of the final report from the Early Intervention Research Institute and should not be viewed as an adequate substitute for that report.

Two pieces of information are presented for each study. The first contains information about the alternative forms of intervention which were being examined. The second page contains a graphic summary of the outcomes for the various measures of child and family functioning. This graph is interpreted as follows. Outcome measures are listed down the left side of the page. Each graph has a vertical line down the center of the remainder of the page. Numbers opposite each outcome measure indicate whether it is the first posttest (represented by "1"), second posttest (represented by "2"), etc. The location of the number with respect to the vertical line indicates the results for that test. If the number is to the left of the line, the group on the left side of the line did better. The distance from the vertical line represents the size of the effect in standard deviation units. If a number is circled, the result was statistically significant at $p \leq .10$.

To illustrate for one study, consider the Jordan Intensity Study on pages 142 to 187. Two groups (3 days a week vs. 5 days a week) were compared on a variety of measures of child and family functioning. The result for the Battelle Developmental Inventory's cognitive subtest was about .27 standard deviation units in favor of the 5-day-per-week group at the first posttest (statistically significant at $p \leq .10$)

and .07 standard deviation units (not statistically significant) in favor of the 3-day-per-week group at Posttest #2. Larger bold numbers indicate the average effect for all child or all family measures for a particular posttest.

The interpretation of the results of each study depend on the **pattern** of results for the entire set of dependent variables as much as the individual results for various measures. This type of graphic representation provides a summary of the magnitude, direction, and statistical significance of a large number of measures which are useful in interpreting the overall effect of the alternative types of intervention.

Subject and Study Characteristics for Longitudinal Studies of the Effects of Alternative Types of Early Intervention

Project Name	Comparison	Type of Handicap[a]	Average BDI DQ at Start	Age-at-Start (months)	Sample Size[b]	Percent Caucasian	Median (Mean) Household Income	Years of Education for Mother	Percentile on PSI[c]	Percentile on FRS[d]	Percentile on FSS[d]	Average Effect Size Differences Between Groups at Pretest[e]		
												Demographics	Child Functioning	Family Functioning
SMA (Illinois)	1 vs. 3 hours per week, center-based	combo	57	13.0	75	85	$27,500 ($28,879)	13.3	70	51	59	.00	.07	.25
Arkansas Intensity	1 vs. 4 hours per month, home-based	combo	50	27.4	71	95	$13,000 ($16,321)	11.9	81	43	57	-.05	.18	-.13
Jordan (Utah)	3 vs. 5 days per week, center-based	combo	62	50.1	53	94	$27,500 ($30,148)	13.4	66	51	57	.30	.07	.30
New Orleans VI (Louisiana)	Individualized parent-infant sessions vs. parent group meeting	visual impair	66	14.7	29	80	$22,500 ($28,447)	13.0	47	55	52	-.16	-.43	.10
SC IVH (S. Carolina)	3 months vs. 18 months	IVH	75	3.7	68	33	$13,000 ($16,580)	12.6	66	46	53	-.09	-.09	-.22
SLC IVH (Utah)	3 months vs. 18 months	IVH	97	3.0	58	89	$22,500 ($26,425)	13.2	64	55	71	.14	.46	.27
Columbus (Ohio)	1 month prior to hospital discharge vs. services at age 3	BPD	109	1.3	24	79	$22,500 ($31,130)	12.9	46	55	14	.16	.17	.27
Des Moines (Iowa)	Center-based vs. center-based plus parent involvement	combo	64	52.7	76	86	$ 9,500 ($17,719)	12.1	80	50	54	.28	.00	.03
Utah Parent (Utah)	Center-based vs. center-based plus parent involvement	combo	55	47.1	56	67	$22,500 ($22,491)	13.6	83	40	55	.03	.15	-.10
Avg Across Studies														
	$\bar{X}$ =		70.6	23.7	56.7	78.7	$20,550	12.9	67.0	49.6	52.4	.07	.06	.09
	SD =		19.9	21.3	19.0	19.1	$ 6,573	.6	13.6	5.5	15.5	.16	.24	.20

NOTES

[a] "Combo" indicatse a group of children with a variety of handicapping conditions such as would typically be served in an early intervention program which does not focus specifically on a particular handicapping condition; "IVH" indicates a low birth-weight baby who has suffered an interventricular hemorrhage; "BPD" indicates an infant who has Bronchopulmonary Dysplasia.

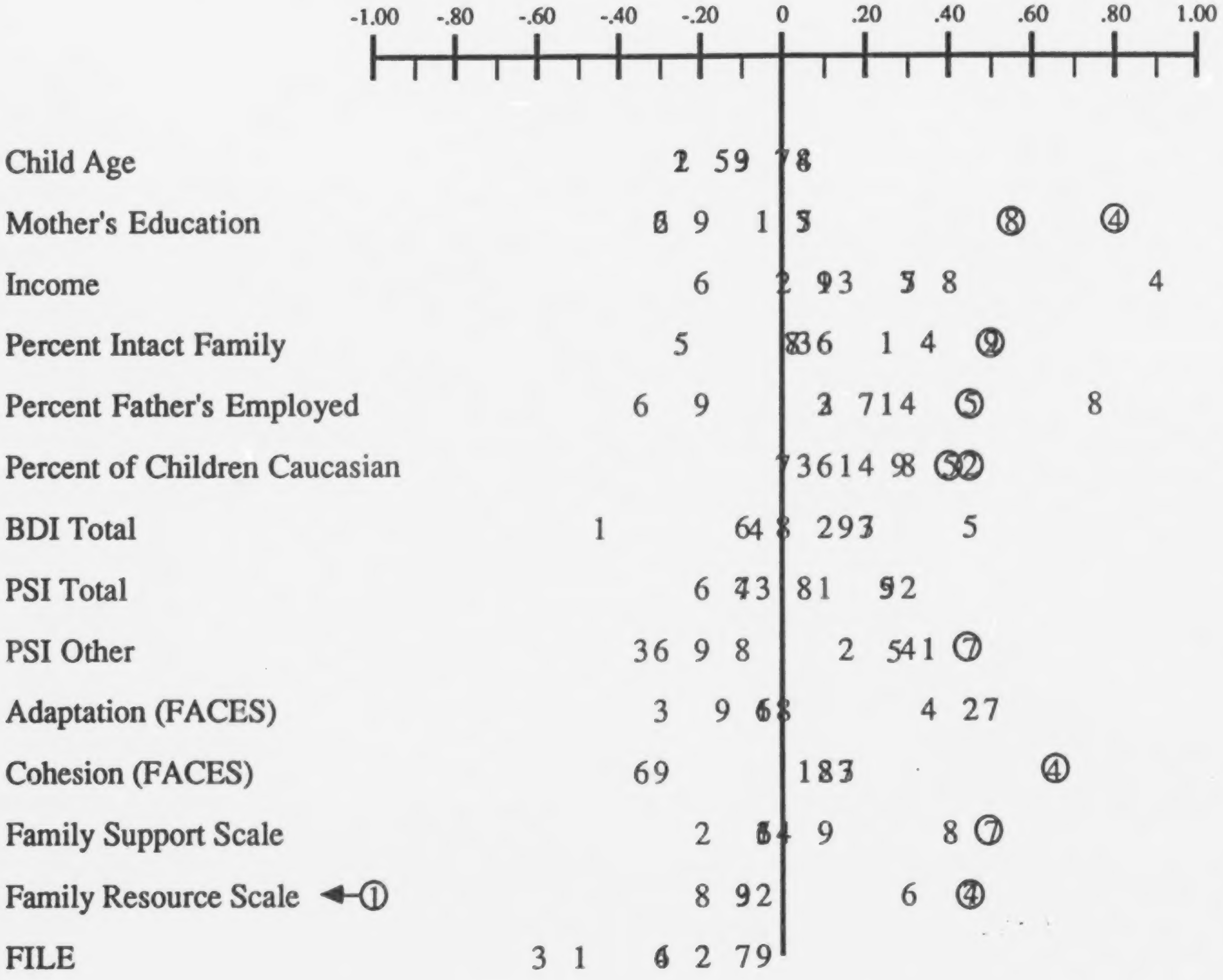
[b] Sample size indicates the number of children participating in the study at the time pretest data were collected.

[c] The "PSI" is the Parenting Stress Index. Percentiles are taken from the norms provided with the PSI technical manual. Higher percentile scores indicate greater levels of stress.

[d] Percentiles for the "FRS", Family Resources Scale and "FSS", Family Support Scale, are computed based on the sample of families participating in these longitudinal studies since no published norms are reported for the scale. A higher percentile indicates a greater number of family resources.

[e] Effect size for any particular measure is defined as the means on that measure for experimental group 1 minus the mean of that measure on experimental group 2 divided by the standard deviation on the measure $[(x_1 - x_2) - SD]$. For demographic characteristics, this is the average effect size for child's age, income, mother's education, percent intact families, percent father's employed at technical managerial level or above, and percent ethnic minority. For child functioning, it is the effect size for the total BDI score and for family functioning, it is the average effect size for the Parenting Stress Index and the Family Adaption and Cohesion Scales.

PRETEST SCORES FOR ALL SITES



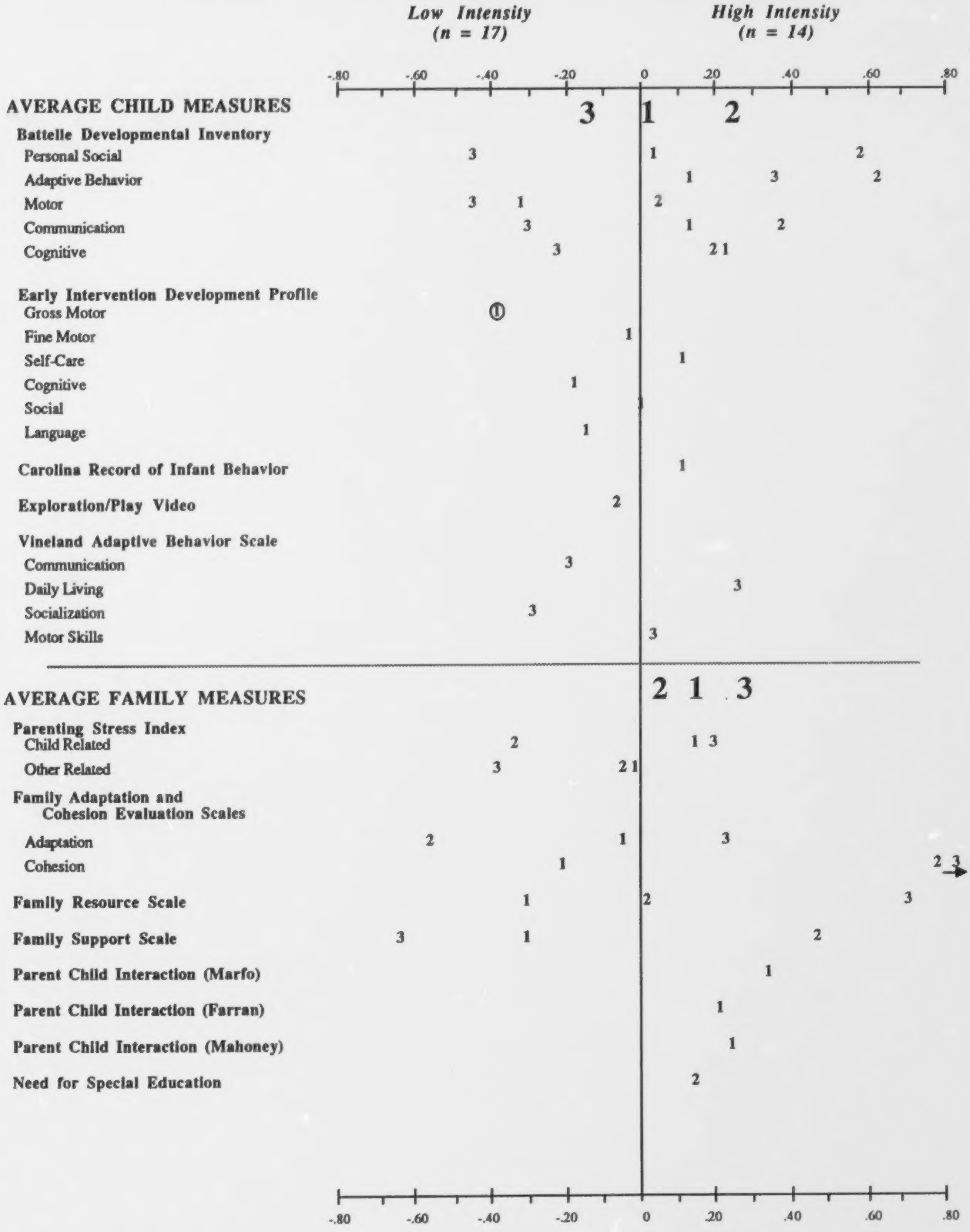
NEW ORLEANS VISUALLY IMPAIRED STUDY

Design

- ***30 infants/toddlers with mild-severe visual impairments randomly assigned to 2 interventions***

Low Intensity	**High Intensity**
• Contact with family average of 1 time per month	• Contact with family 4 times per month
• Contact with parent only	• Contact with parent and child
• General information related to VI given to parents	• Individualized Family Service Program for child and family
• Parents seen in a small group	• Parents seen individually
• Meetings held at the center	• Most visits with parents at their homes
• Variety of guest speakers	• Consistent primary intervenor, i.e., certified special education teacher and social worker
• Group presentations by doctors, educators, therapists re: --child development --effects of visual impairment on development --information regarding etiologies --Reach Out & Teach Handbooks	• Individualized consultation with O.T., P.T., speech/language therapist,
	• Intervention based on: --Louisiana Curriculum --Reach Out & Teach --Naturalistic teaching opportunities --Focus on family and environment

NEW ORLEANS VISUALLY IMPAIRED

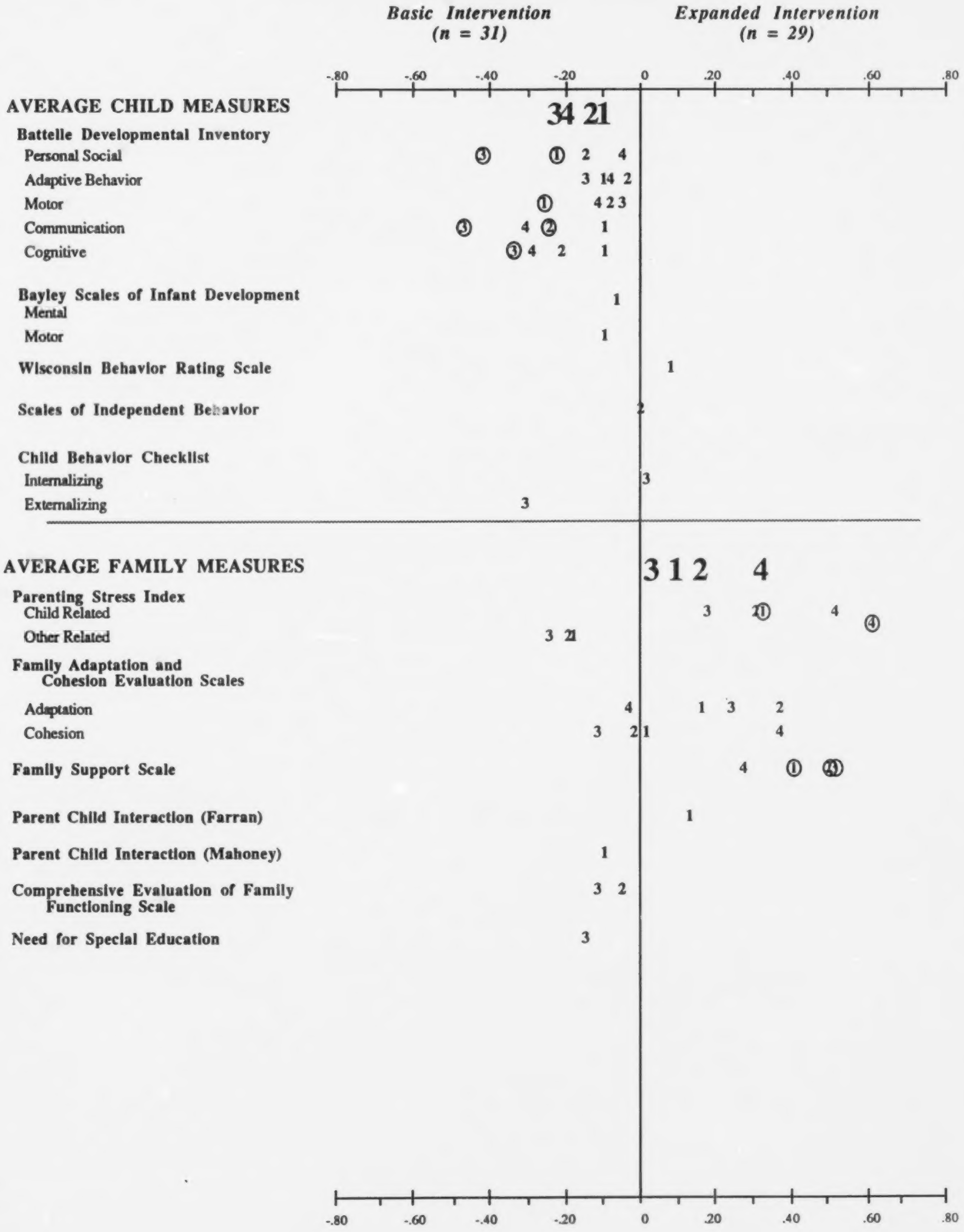


SMA/LAKE McHENRY INTENSITY STUDY

Design

- 72 children with disabilities randomly assigned to receive early intervention services 3 times per week versus 1 time per week
- Services provided primarily at center by parent-infant educator. Some home services provided if transportation is a problem.
- Content of IEP driven by child assessment and family needs, but no specific curriculum used.
- Intervention focused on development in
    - personal/social
    - adaptive behavior
    - motor
    - language
    - cognitive
- Parents were expected to learn intervention techniques and implement them at home as appropriate. Program also provided emotional support to parents and assisted parents to obtain needed assistance outside the program.

SMA INTENSITY STUDY



ARKANSAS INTENSITY STUDY

Design

- Seventy-seven 3- to 48-month-old handicapped children randomly assigned to standard (1 time per week) or expanded (2 times per week) home-based interventions.

- Services provided by 9 home visitors, each of whom provided services to some children in each group.

- Intervenors worked directly with the child; parents expected to observe, do follow-up activities, and keep data between visits.

- Intervention focused on development of functional skills in all developmental areas as specified by IEP. Most frequent areas of emphasis:

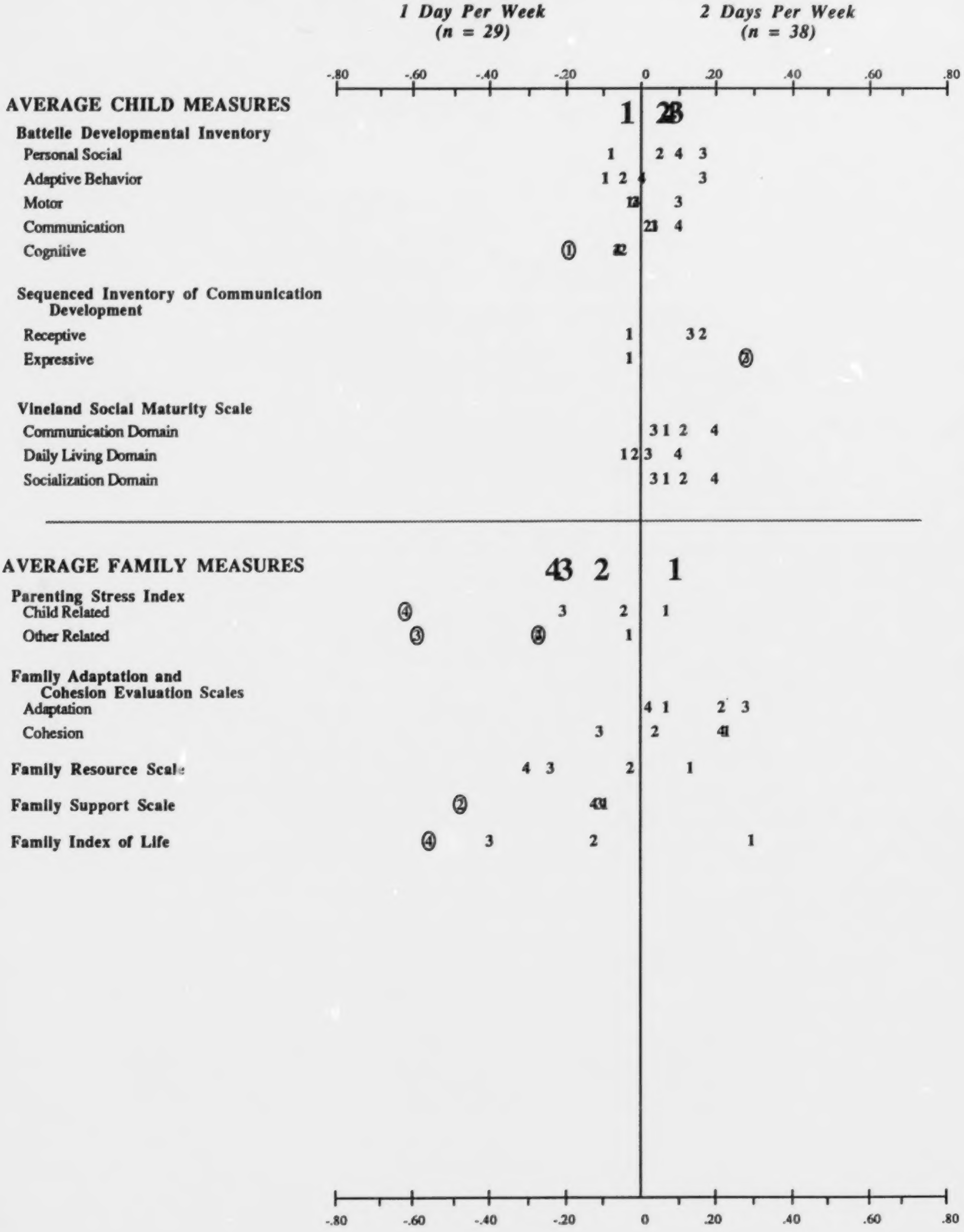
  Self help (particularly feeding)

  Gross motor

  Communication

- Additional speech or motor therapy provided as needed in a center-based program.

ARKANSAS INTENSITY STUDY



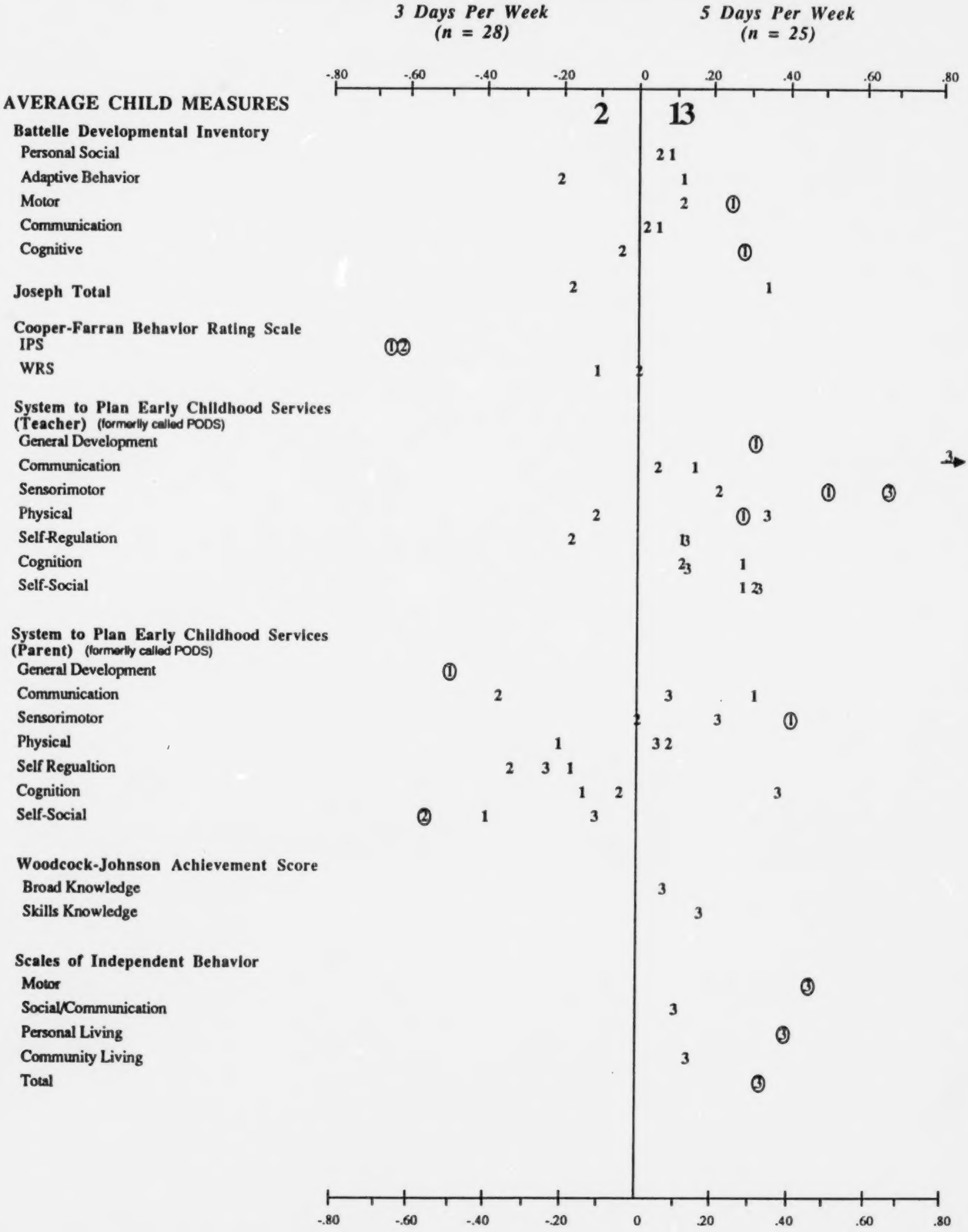
JORDAN INTENSITY STUDY

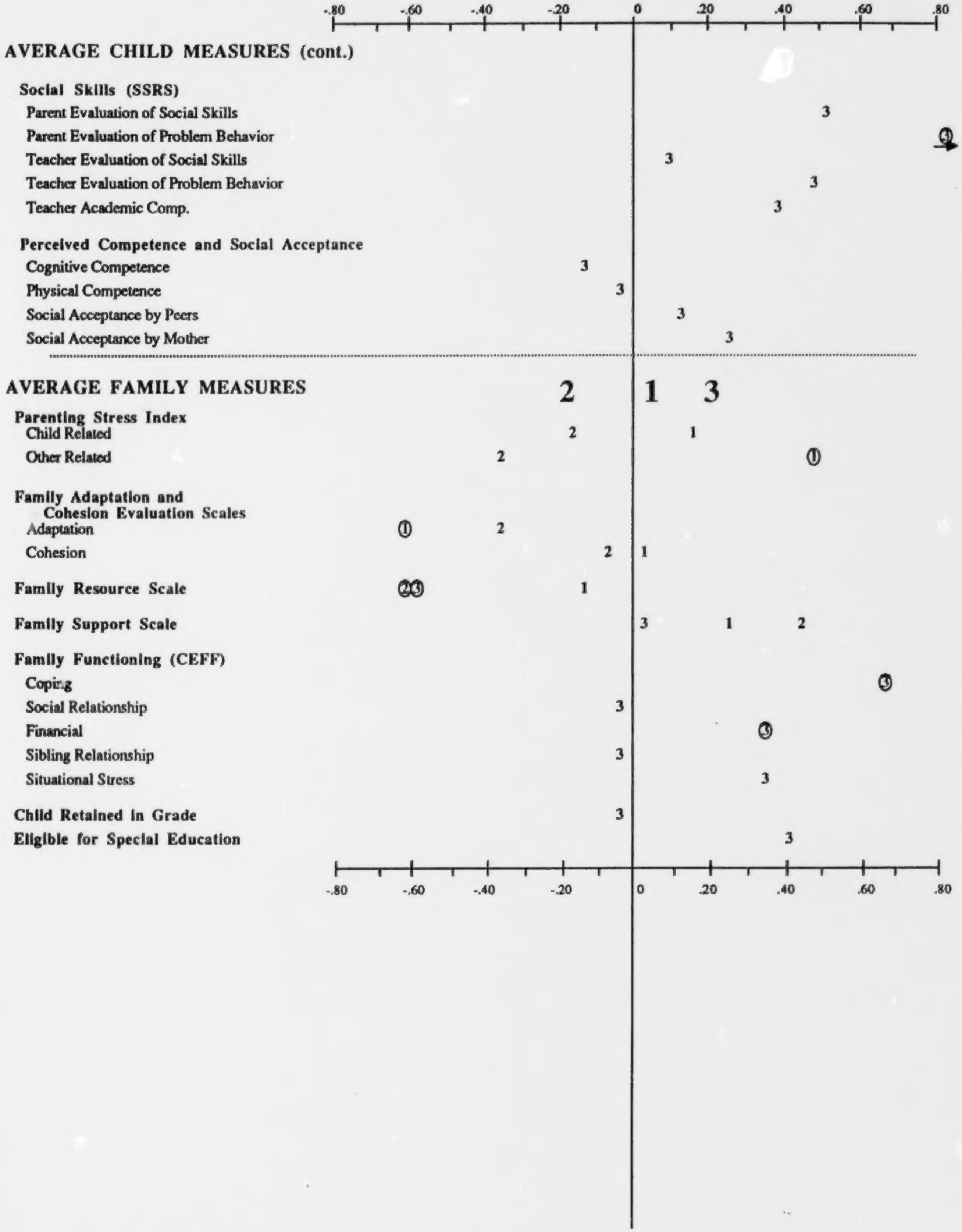
Design

- ***53 mildly to severely handicapped preschool-aged children randomly assigned to 2 intervention groups.***

Less Intensive Intervention Program	**More Intensive Intervention Program**
• 3 days per week: 2 hours per day	• 5 days per week; 2 hours per day
• 1:5 teacher/child ratio	• 1:3 teacher/child ratio
• One teacher assisted by two paraprofessional aides	• One teacher assisted by four paraprofessional aides
• Communication therapist available in classroom every other day	• Communication therapist available in classroom every day
• Intervention based on IEP using varied curricula through a theme-based, developmentally appropriate approach focused on teaching skills during daily activities	• Intervention based on IEP using varied curricula through a theme-based, developmentally appropriate approach focused on teaching skills during daily activities

JORDAN INTENSITY STUDY




-.80 -.60 -.40 -.20 0 .20 .40 .60 .80
AVERAGE CHILD MEASURES (cont.)
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Eligible for Special Education 3
-.80 -.60 -.40 -.20 0 .20 .40 .60 .80

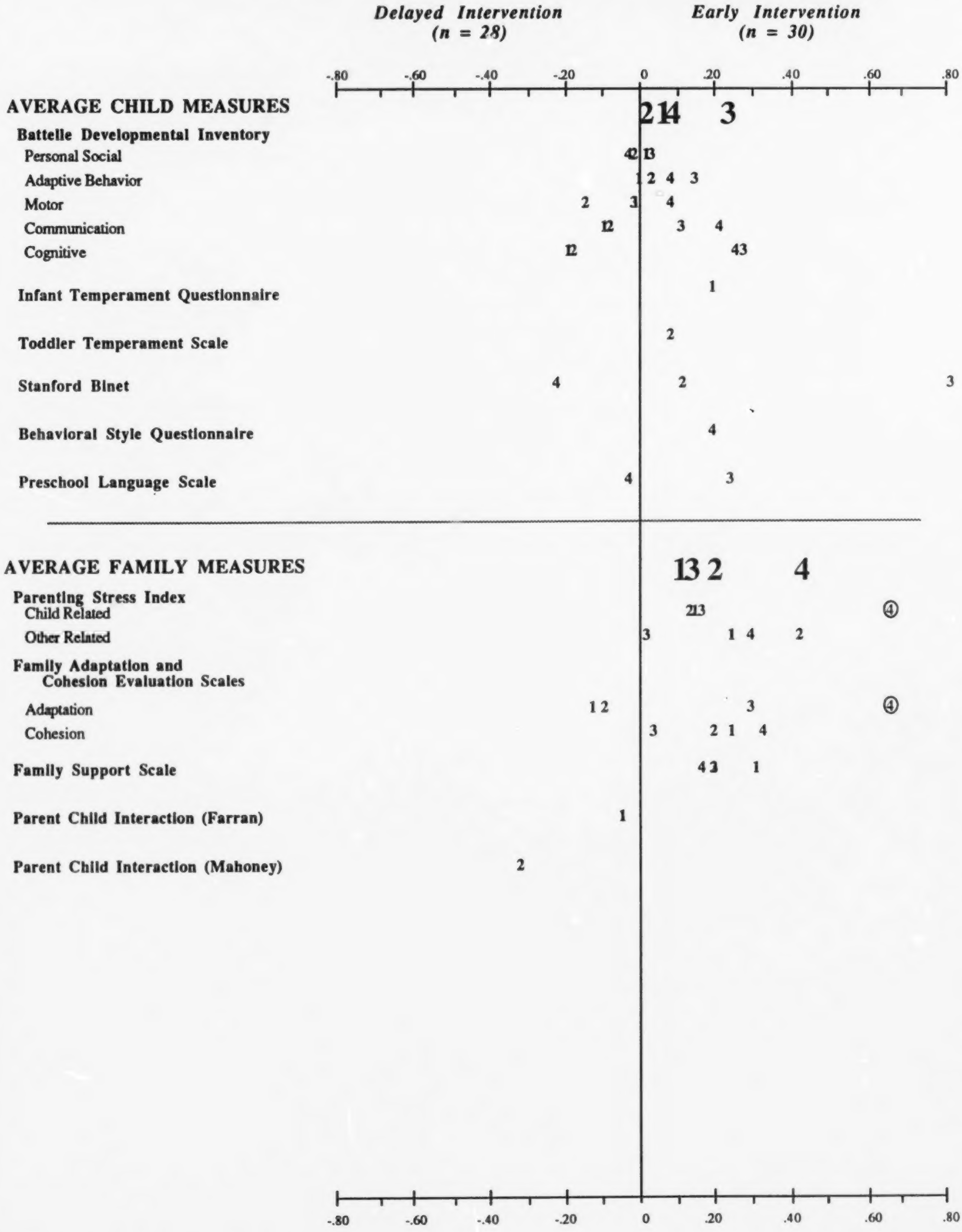
SALT LAKE CITY MEDICALLY FRAGILE STUDY

Design

- *58 intraventricular hemorrhage (IVH) infants randomly assigned to 2 intervention groups.*

Delayed Intervention	Early Intervention
3 Months Corrected Age	**3 Months Corrected Age**
• Medical follow-up: Utah State Department of Health Neonatal Follow-Up Clinic or private physician	• Medical follow-up: Utah State Department of Health Neonatal Follow-Up Clinic or private physician
	• Sensorimotor intervention --Registered physical or occupational therapist --Curriculum and Monitoring System (CAMS) Motor Program --1:1 child/therapist ratio --Parent instruction --Monthly to weekly visits --Home- and/or center-based
	• Assistance in locating community services
18 Months Corrected Age	**18 Months Corrected Age**
• Sensorimotor intervention	• Sensorimotor intervention
• Developmental intervention	• Developmental intervention
• Certified teacher	• Certified teacher
• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)	• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)
• Parent instruction	• Parent instruction
• Monthly visits	• Monthly visits
• Home- and/or center-based	• Home- and/or center-based
• Assistance in locating community services	• Assistance in locating community services

SALT LAKE CITY MEDICALLY FRAGILE STUDY



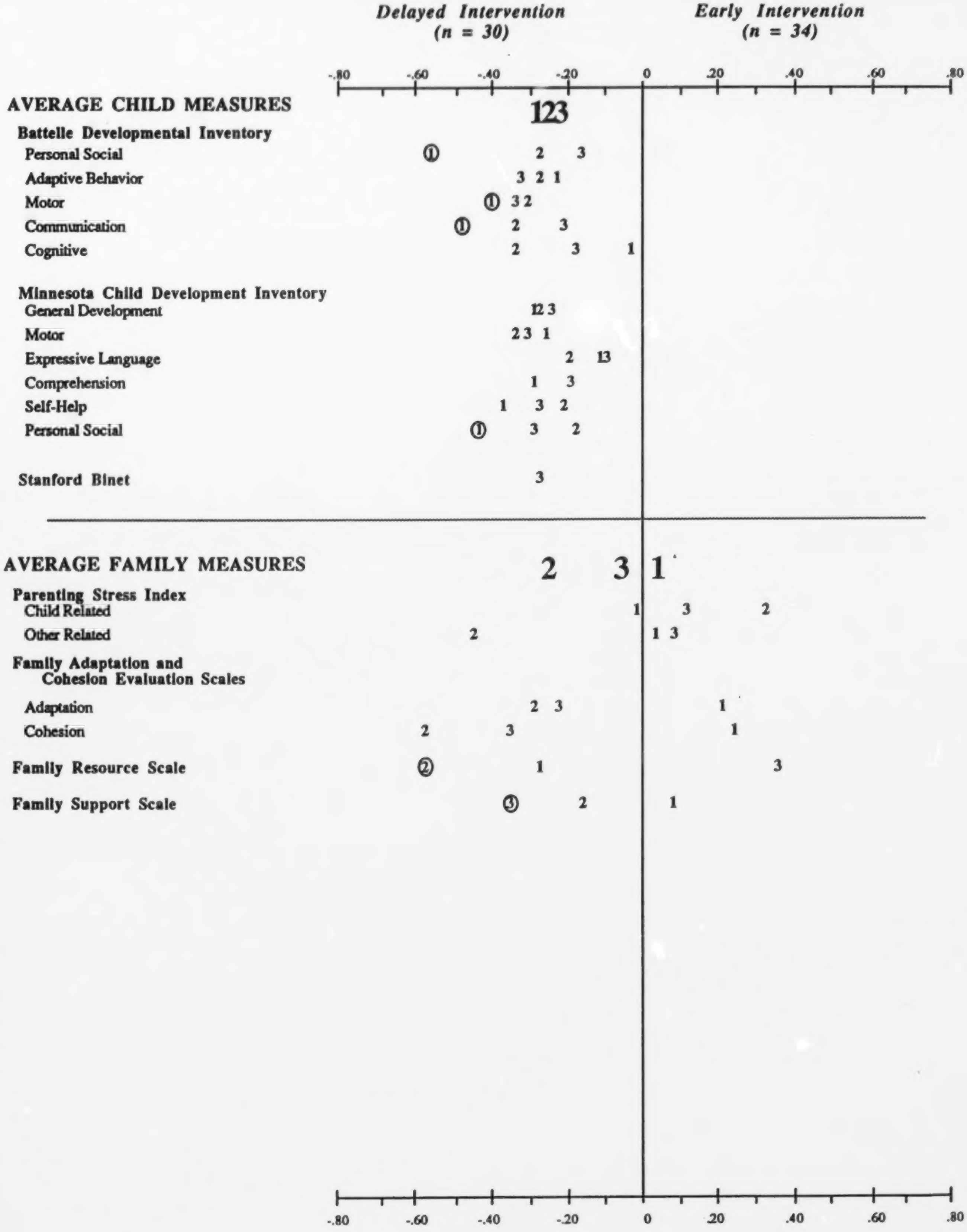
SOUTH CAROLINA MEDICALLY FRAGILE STUDY

Design

- ***68 infants who were born prematurely and suffered major complications including intraventricular hemorrhage (IVH) and very low birthweight (< 1000 g), recruited in the hospital before discharge and randomly assigned to 2 groups.***

Delayed Intervention	Early Intervention
3 Months Corrected Age	**3 Months Corrected Age**
• Medical follow-up: South Carolina Department of Health Neonatal Follow-Up Clinic or private physician	• Medical follow-up: South Carolina Department of Health Neonatal Follow-Up Clinic or private physician
	• Sensorimotor intervention --Registered physical or occupational therapist --Curriculum and Monitoring System (CAMS) Motor Program --1:1 child/therapist ratio --Parent training --Twice monthly visits
	• Assistance in locating community services
12 Months Corrected Age	**12 Months Corrected Age**
• Sensorimotor intervention	• Sensorimotor intervention
• Developmental intervention	• Developmental intervention
• Certified teacher	• Certified teacher
• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)	• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)
• Parent training	• Parent training
• Monthly visits	• Monthly visits
• Home- and/or center-based	• Home- and/or center-based
• Assistance in locating community services	• Assistance in locating community services

SOUTH CAROLINA MEDICALLY FRAGILE



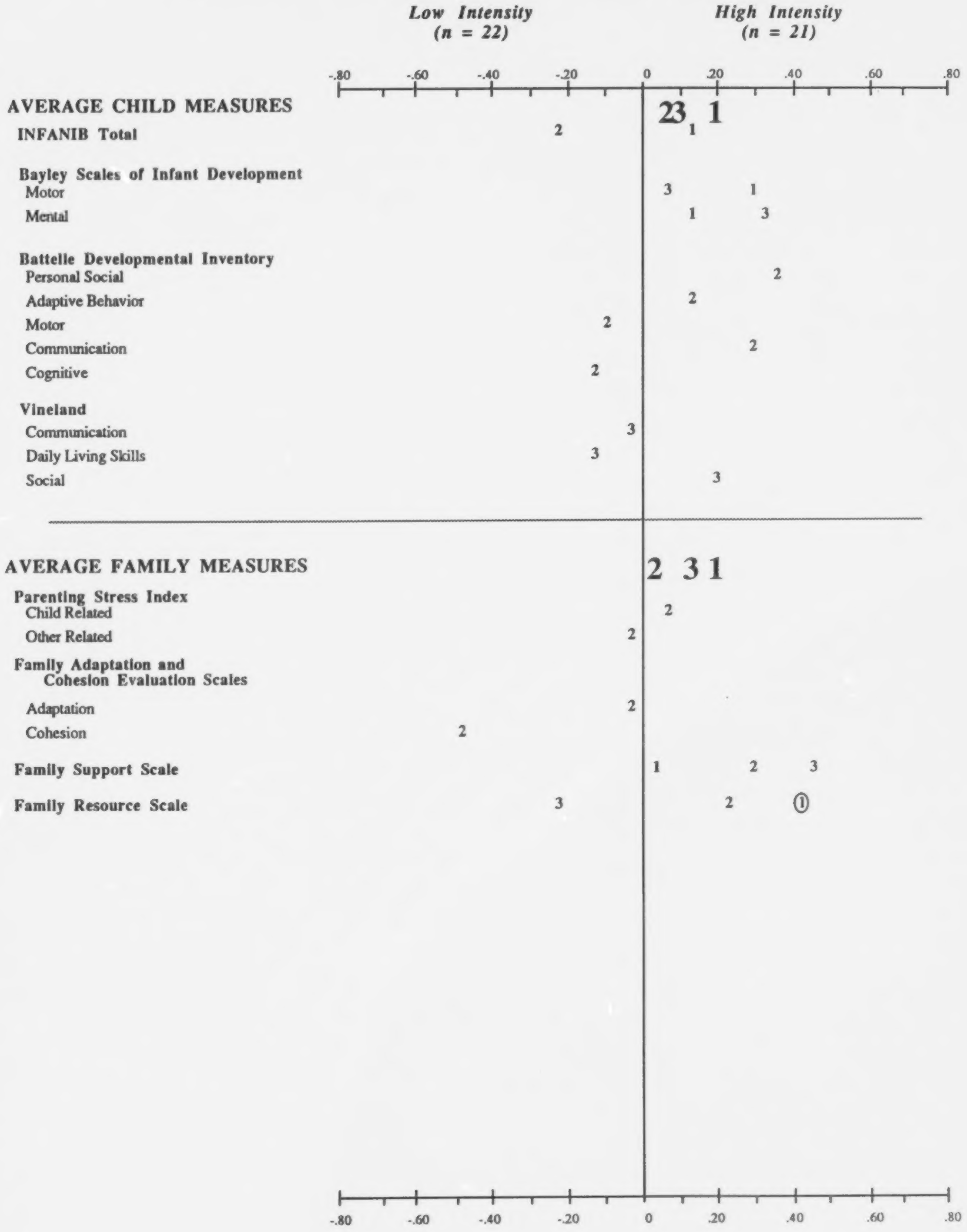
COLUMBUS MEDICALLY FRAGILE STUDY

Design

- ***50 infants diagnosed with bronchopulmonary dysplasia (BPD) or neurological damage randomly assigned to 2 intervention groups***

Low Intensity Intervention	**High Intensity Intervention**
• Medical and developmental follow-up through NICU follow-up clinic	• Medical and developmental follow-up through NICU follow-up clinic
• Referral to community services	• Transition services from NICU to home-based community services --Predischarge hospital visits --Referral to local collaborative group --Collaborative home visits --Additional home visits from local providers
	• Coordinated interdisciplinary early intervention services based on IFSPs --Nursing and medical --OT/PT --Developmental --Social Services --Medical technology personnel
• Referral to local school district or MR/DD programs at age 3	• Referral to local school district or MR/DD programs at age 3

COLUMBUS MEDICALLY FRAGILE STUDY



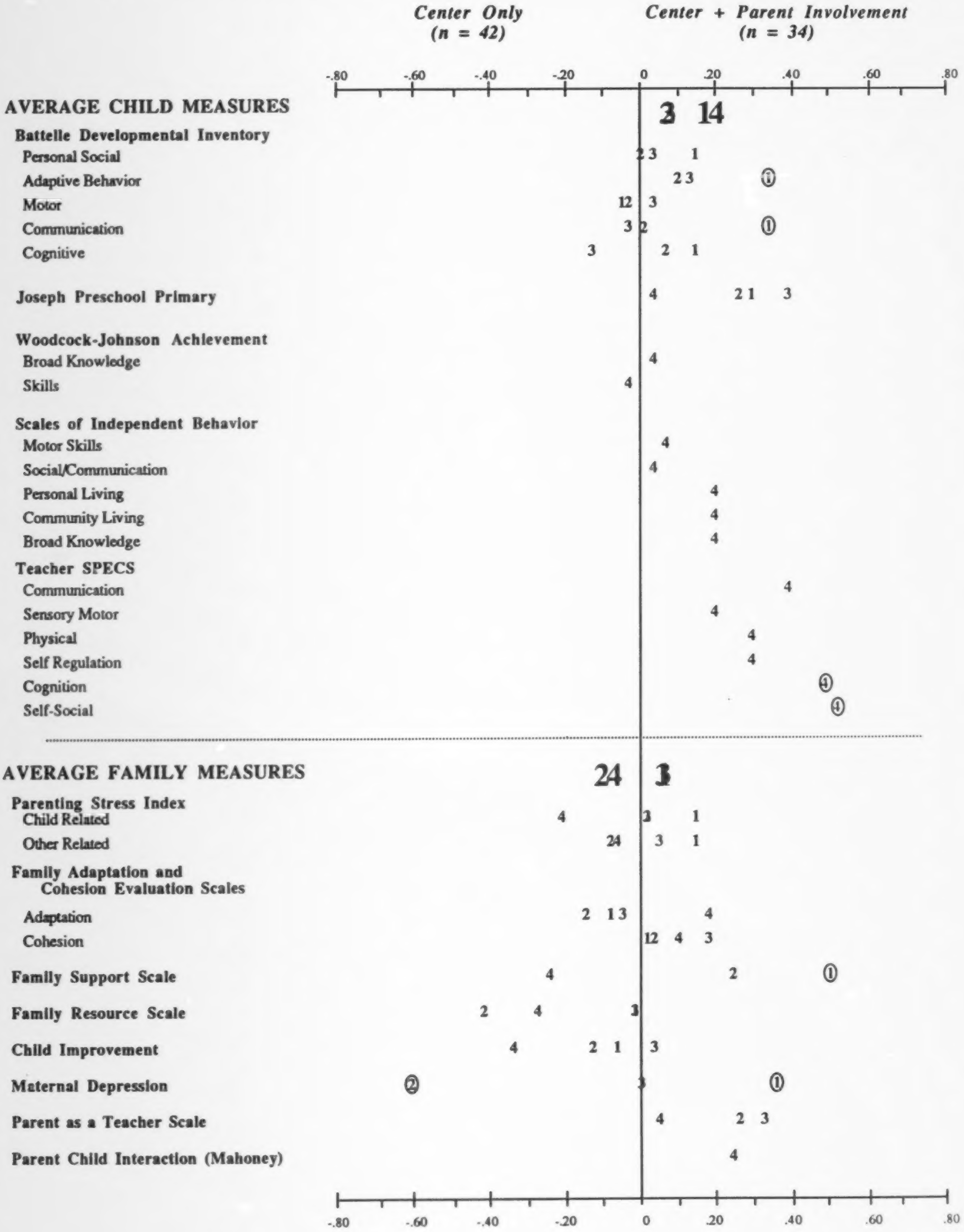
DES MOINES PARENT INVOLVEMENT STUDY

Design

- ***76 mild to severely handicapped children randomly assigned to 2 intervention groups***

Center-Based Intervention	**Center-Based Intervention + P.I.E. Curriculum**
• 5 days per week; 2-1/2 hours per day	• 5 days per week; 2-1/2 hours per day
• 10 children per class	• 10 children per class
• Certified teachers by aides	• Certified teachers assisted by aides
• 5:1 child/teacher ratio	• 5:1 child/teacher ratio
• Therapists in class 1 time per week	• Therapists in class 1 time per week
• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development	• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development
	P.I.E. I
	• Parents attended 16, 2-hour sessions approximately once per week.
	• Sessions emphasized: --Training in teaching/management skills --Information exchange --Social support and networking
	• Each parent selected and implemented an individually-tailored intervention with their child (15 minutes/day, 3-5 times/week)
	***P.I.E. II** (for subjects receiving 2 years of intervention)*
	• Developed based on parent needs assessment
	• Consisted of 12 2-hour sessions
	• Sessions emphasized: --Information exchange --Family support --Social support

DES MOINES PARENT INVOLVEMENT STUDY

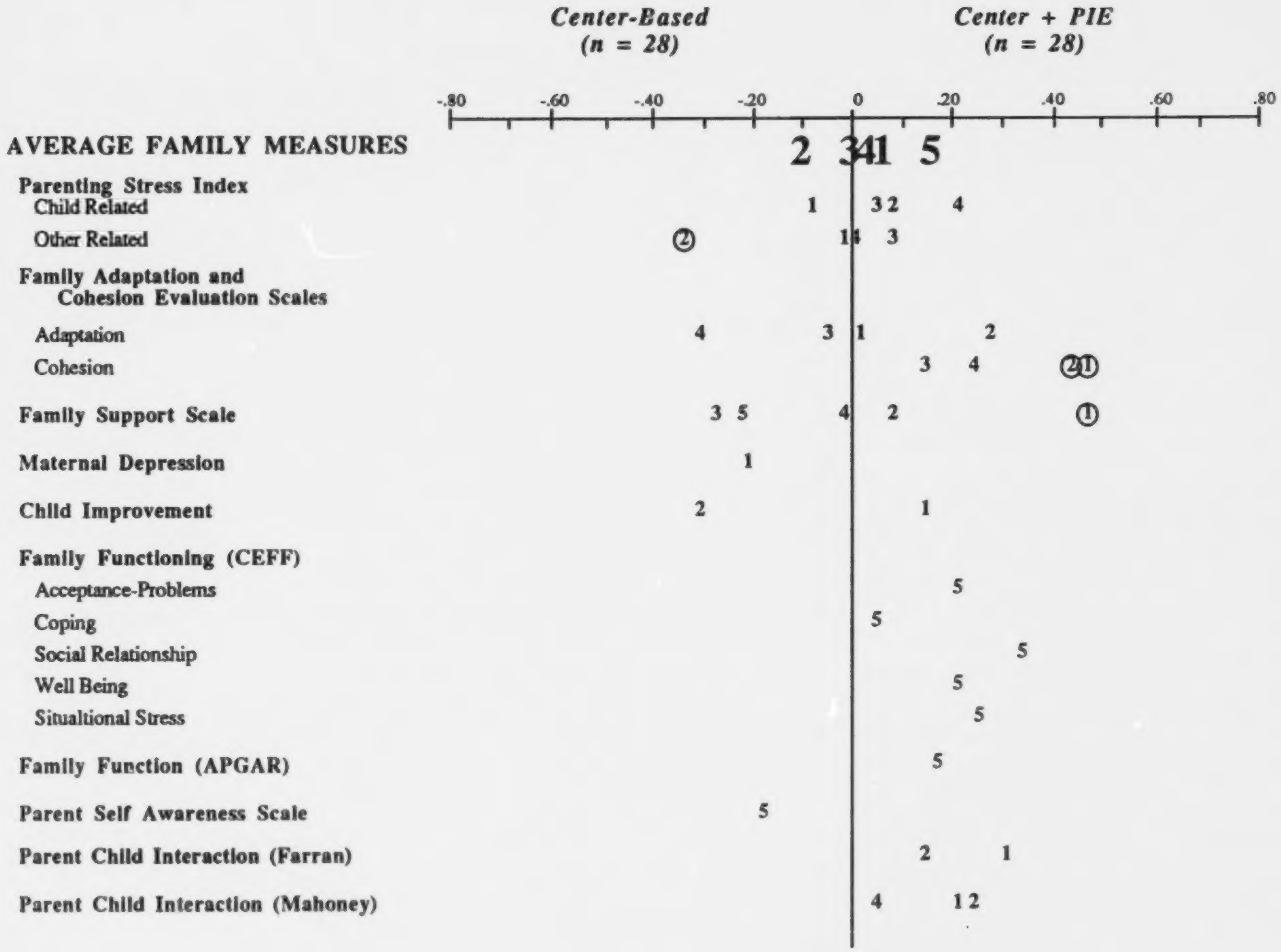


UTAH PARENT INVOLVEMENT '86 STUDY

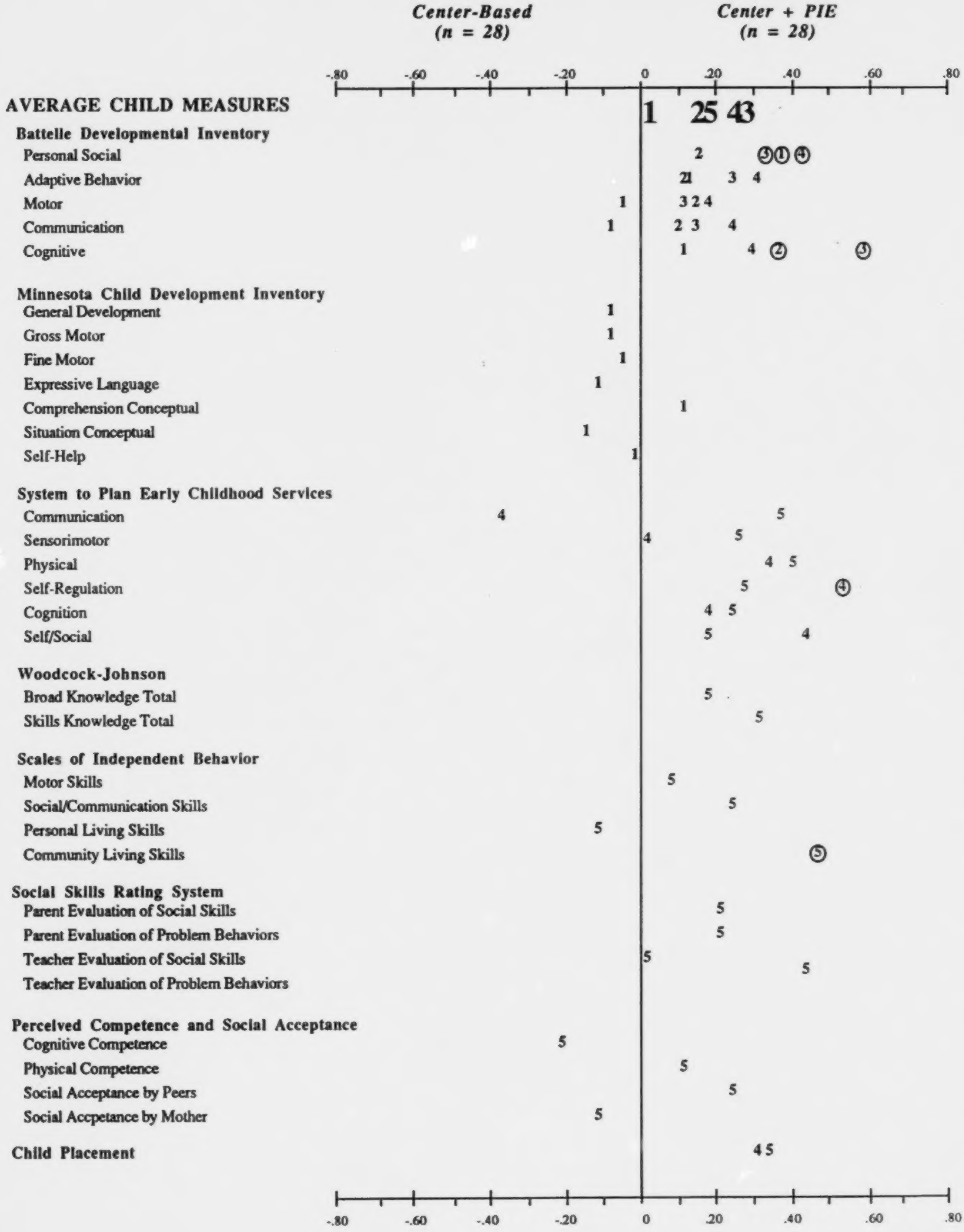
Design

- ***56 moderately to severely handicapped children randomly assigned to 2 intervention groups***

Center-Based Intervention	**Center-Based Intervention + P.I.E. Curriculum**
• 5 days per week; 3 hours per day	• 5 days per week; 3 hours per day
• 10 children per class	• 10 children per class
• Certified teachers assisted by aides and therapists	• Certified teachers assisted by aides and therapists
• 3.6:1 child/teacher ratio	• 3.6:1 child/teacher ratio
• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development	• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development
	• Parents attended 15 2-hour instructional sessions discussing: --observation of child behavior --defining and measuring behavior --theories of child development --criterion-referenced assessment --understanding 94-142 and IEPs --successful intervention strategies --selecting and implementing interventions --communicating with professionals --stress management
	• Social support and networking component
	• Each parent selected and implemented an individually-tailored intervention with their child (15 minutes per day, 3-5 times per week)


Center-Based
(n = 28)
Center + PIE
(n = 28)
-.80
-.60
-.40
-.20
0
.20
.40
.60
.80
AVERAGE FAMILY MEASURES
2 341 5
Parenting Stress Index
Child Related
1 3 2 4
Other Related
② 14 3
Family Adaptation and Cohesion Evaluation Scales
Adaptation
4 3 1 2
Cohesion
3 4 ②①
Family Support Scale
3 5 4 2 ①
Maternal Depression
1
Child Improvement
2 1
Family Functioning (CEFF)
Acceptance-Problems
5
Coping
5
Social Relationship
5
Well Being
5
Situaltional Stress
5
Family Function (APGAR)
5
Parent Self Awareness Scale
5
Parent Child Interaction (Farran)
2 1
Parent Child Interaction (Mahoney)
4 1 2

UTAH PARENT INVOLVEMENT '86



NEW ORLEANS VISUALLY IMPAIRED STUDY (NO/VI)

Project #1

COMPARISON: Children with Visual Impairments -- Weekly individualized parent-infant sessions versus parent group meetings.

LOCAL CONTACT PERSON: David Slade, University of New Orleans

EIRI COORDINATOR: Diane Behl

LOCATION: New Orleans, Louisiana

DATE OF REPORT: 11-12-1991

Rationale for Study

The importance of vision in early development is crucial (see discussions by Barraga, 1986; Ferrell, 1986; Fraiberg, 1977; and Warren, 1984). By age three, infants with visual impairments often demonstrate socio-communicative and cognitive development patterns that are quantitatively and qualitatively different from their sighted peers (Ferrell, 1986; Warren, 1984). Ferrell (1986) stated that all of these secondary disabilities are preventable; they occur because there has not been sufficient, systematic intervention given to the child and his/her family. Although such a position is logical, there is little evidence in the literature which either confirms or refutes the value of systematic intervention in alleviating these secondary disabilities.

Visual impairment also causes a disruption in the interaction between the caregiver and child. Als (1983) observed that the infant with visual impairments signals and communicates differently. These signals are often distorted and difficult to interpret, making positive, constructive interaction even more difficult for parents who often are attempting to cope with the emotions of having an infant with a disability. Rowland (1984) summarized the position of most researchers involved with children with visual impairments by stating, "The importance of appropriate exchanges between mothers and infants cannot be overstressed."

Though the importance of early intervention for children with visual impairments and their families has been stated frequently in literature, few controlled prospective studies have been completed on children with visual impairments, especially at the infant and toddler levels (Warren, 1984). Furthermore, even though researchers speculate that intensive intervention for both child and family is necessary, there is a dearth of evidence regarding the intensity with which this intervention should be provided. Additionally, little data are found to assist in answering the question of how to provide the best intervention (White et al., 1985-86).

This study of early intervention for infants and toddlers with visual impairments compares the immediate and long-term effects of a comprehensive, home-based intervention in the form of one time per week parent-child sessions, with a much lower intensity treatment of informal parent group meetings held approximately 12 times per year. To set the context for this study, existing research on the effects of early intervention with visually impaired children will first be summarized briefly. A description of this study will follow, providing a description of the subjects and the alternative interventions as well as the research procedures. Results based on the study to date will be presented along with conclusions.

Review of Related Research

Since 1969, 11 studies with visually impaired children have investigated the effectiveness of early intervention. The nature of these studies, including subjects, intervention, outcome measures, and results are summarized in Table 1.1.

Table 1.1

Summary of Early Intervention Studies Involving Children with Visual Impairments

Reference	Children (age, n)	Intervention Descript.	Experimental Design	Outcome Measures	Conclusions	Weaknesses
Adelson & Fraiberg (1974)	10 infants, mod-severely VI, no other handicaps.	Bimonthly home visits for 1-2 years. Developmental guidance program linking sound and touch in play and parent-infant interactions.	Posttest only compared with sighted control and with large group of VI infants from earlier study.	Gross Motor items from Gessell & Amatruda; Bayley Scales of Infant Development.	Intervention can accelerate development of mobility in children with visual impairments.	-- Small sample size. -- Comparison VI group had almost 3 times as many premature infants or had later entry ages. -- No random assignment, no naive testers. -- Control group used different outcome measures.
Allegheny County Schools (1969)	Seven preschoolers, all legally blind with varying developmental levels.	6 weeks of center-based training emphasizing exploration and independence.	Pre-posttest	Orientation and mobility of Young and Blind Children (Lord, 1967). Body image of Blind Children Screening Test (American Foundation). Video tapes over time.	Intervention improved several aspects of self-help, vision, and socialization.	-- Small sample. -- No control group. -- Possibly had inconsistent program. -- No treatment verification. -- No mention of naive testers
Bregani et al. (1981)	8 infants and toddlers with ROP.	Weekly 1-hour visits for 1 year focused on parent-child interaction.	Pre-posttest	Brunet-Lezine Scale of Psychomotor Development, Neurological and ocular exams.	Intervention had positive effects on mother-infant dyads presumed to be at-risk for psychotic disturbances.	-- Small sample. -- No control group. -- No mention of naive testers.
Correa, Poulson, & Salzburg (1984)	3 preschool children, severely multiply handicapped.	One-time training in reach-grasp responding conducted in a center.	Multiple baseline design.	Recording of reach-grasp responses.	Intervention effective for training motor skills in blind, severely retarded preschoolers.	-- Small sample. -- No control group. -- Multihandicapped
Fraiberg (1977)	10 blind infants, no other handicaps.	Twice-monthly home visits for three years focusing on parent-child interactions.	Pre-posttest.	Videotaped performance.	Intervention improved VI children to levels closer to sighted children than blind children who received no intervention.	-- Small sample size. -- No control group. -- No mention of naive testers.
Harley, Long, Merbler, & Wood (1986)	Infants, 0-2 years, multiply impaired, 22 participants blind or no useful vision	Orientation and mobility training, 16 weeks--Cognitive, motor, sensory development training conducted with some at home, some in the center, used graduated guidance.	Repeated measures or treatments by subject paradigm analyzed pre-post gain scores.	Peabody Mobility Kit for Infants, Parent Satisfaction	Proported high level of parent satisfaction. Programmed intervention was successful with statistically significant gains in Cognitive, movement, and skill areas. No significant gains in motor or sound local.	-- Confounded by additional services -- Experimental intervention confounded by some children receiving p.t. or similar classroom intervention -- No mention of naive diagnosticians

(continued)

Adapted from Olson, M. (1987). Early intervention for children with visual impairments. In M. J. Guralnick & F. C. Bennett (Eds.), The effectiveness of early intervention for at-risk and handicapped children (pp. 318-321). Orlando, FL: Academic Press.
Updated--July 1991

Table 1.1 (continued)

Summary of Early Intervention Studies Involving Children with Visual Impairments

Reference	Children (age, n)	Intervention Descript.	Experimental Design	Outcome Measures	Conclusions	Weaknesses
Klein, Hasselt, Trefelner, Sandstrom, & Brandt-Snyder (1988)	22 visually impaired and mentally handicapped infants/toddlers 0-3 years	Families had 2 hour weekly sessions for 6 month period--sounds like sessions, but unclear monthly "booster" sessions for next 6 months. Goals: (1) enhance social responsibility in children, (2) develop parenting skills and psychological adjustment, (3) collect qualitative interactions and adjustment data.	Single group posttest only.	Qualitative interaction data, observational, self-report.	Preliminary analyses and anecdotal reports from families suggest "utility" of effort. No formal results yet.	-- No comparison group -- No results as yet -- No baseline data -- No mention of naive testers
Montgomery Public Schools (1988)	27 visually impaired children, mean age of 12 months.	Combination of services within a county including home-based, center-based, and Head Start.	Pre/Post comparison. Value-added analysis (change in developmental age in month related to months of intervention)	Battelle Developmental Inventory, Family Satisfaction	Authors stated that short-term program effects could not be determined since numbers were too few.	-- No control group -- Mixture of intervention types
O'Brien (1976)	33 subjects, Birth to 8 years with mild to severe VI.	Home or center-based, parent training for 8 months emphasizing overall development.	Pre-posttest.	Visual Effic. Scale; school health forms, Bolea Pictorial Self-Concept Scale, Boehm Test of Basic Concepts (1971), anecdotal records, instruments developed by researchers.	Program goals were met.	-- No control group. -- No uninformed testers. -- Interventions differed across subjects.
Olson (1983)	15 VI 2-6 year olds.	Home or school intervention for an average of 2.7 years.	Post-only comparison based on initial differences and sighted control group.	Performances rated by teachers of VI children; independent viewing and scoring of 10 categories of behavior.	Intervention created no significant difference between sighted and visually impaired children.	-- Differences in past education confound study. -- No VI control group. -- Interventions differed across subjects.
Rogow (1982)	10 subjects, 1-7 years of age, multi-handicapped.	Home or school intervention for 10 months using graduated prompting strategies.	Pre-post.	Piagetian stages of language development to determine child's functional level of communication via parents, teachers, videotapes.	Intervention increased awareness of social interaction.	-- No non-treatment group. -- Small sample size. -- Very heterogenous group. -- Intervention not consistent across subjects. -- No naive testers.

Unfortunately, as will be discussed below, critical components necessary for the results of these studies to be considered well-controlled investigations were lacking.

As can be seen in Table 1.1, one of the most serious problems with past research is the lack of appropriate comparison groups; the visually impaired subjects were typically compared to either normally sighted peers or a blind comparison group from a previous study. The current study improved upon these research designs by using random assignment of a sample of children with visual impairments to one of two treatment conditions. In addition to lacking appropriate comparison groups, the conclusions of these previous studies are difficult to interpret because very little demographic information is presented about participating subjects (i.e., it is difficult to know whether subjects who come from families with high socioeconomic status respond differently to intervention than subjects who come from families with low socioeconomic status, or whether subjects who are more severely visually impaired respond differently than those who have moderate visual impairments). Because of the extensive demographic data collected as a part of this study, such questions can be examined.

Another point relative to previous research is that exemplary services designed for children with visual impairments have generally been described as needing to be comprehensive in nature, providing systematic instruction to the child as well as providing parents with instructional strategies and support. Unfortunately, most previous studies have not provided clear descriptions of their interventions and have not verified that the intended interventions were actually delivered. The lack of information about the expertise of the intervenors, specific training techniques, curricula, and shaping procedures has made it difficult to understand the comprehensiveness of previous treatments as well as making it difficult for others to replicate the interventions (Guralnick & Bennett, 1987). The collection of treatment verification data by the study, described more fully in a subsequent section, provides specific information about the nature of the interventions used in this research.

As a third point, the majority of previous studies have also failed to measure critical outcomes that may have been affected by the intervention. Using a family-focused approach, the high intensity intervention is sensitive to the effects of the child on the total family, the effects of the family on the child, and the effects of external supports on the child and family. Through the use of measures sensitive to these interactions, this study will provide important assessment data that have been missing from previous studies (see Table 1.1).

All of the studies which reported findings concluded that early intervention resulted in substantial benefits for participating children. However, the methodological weaknesses must be considered when interpreting the results. For example, past studies have been based on very small sample sizes, or single-subject designs. Although such research methods are valuable, further replication is needed to verify the findings. Although the sample size of the study described in this report is relatively small in comparison to most generic early intervention studies, it is larger than studies of children with visual impairments. Additionally, 4 of the 11 studies cited involved subjects with substantial multiple disabilities. More studies are required to investigate the effects of intervention on children who are primarily visually impaired. The study which is described in this report recruited children who were primarily visually impaired with no other severe organic disabilities (e.g., hearing or physical impairments).

Longitudinal data are also needed to determine whether effective early intervention programs continue to have a noticeable effect on children as they get older (Warren, 1984). Though five of the eight previously cited studies with children with visual impairments had interventions that were at least eight months in duration, none of them provided information regarding long-term effects of the treatment. Since this study includes outcome data for several years following the treatment, it provides some needed information concerning long-term treatment results.

Finally, this study provides an economic perspective on early intervention. One would expect the intensive program to be much more expensive. Therefore, it is important to find out whether the additional costs are justified in terms of the gains made by children or the effects on the family. Furthermore, it is important to find out whether a less expensive program such as the low intensity parent group meetings may result in some benefits (e.g., positive effects on family functioning) that may not be present in the more expensive program which focuses more directly on child progress. Unfortunately, very little attention has been given to cost analysis issues in previous early intervention research, particularly with children with visual impairments.

Methods

Services for children in both groups were funded by the Louisiana Office of Education. The service program was developed by a certified teacher of the visually impaired with extensive experience in service provision and research. Staff who provided direct services included special educators, a social worker, and consulting service providers who were therapists at the Human Development Center at Louisiana State University Medical Center. The program was developed for the research project and provided services to children with visual impairments and their families who otherwise would not have received services. Assistance in the identification of potential research subjects, as well as information regarding various aspects of the subject's vision (i.e., acuity, perception, and discrimination), was provided by the Louisiana State University (LSU) Eye Center.

The geographical area served included the area within a 60-mile radius of New Orleans. Other services available at that time in this area for 0- to 3-year-old children with visual impairments were limited to programs designed to serve children with developmental delays or those that provided private motor and/or speech/language therapy. Consequently, most 0- to 3-year-old children with visual impairments in this area have typically not received any services until they were 3 years old.

Subjects

A total of 35 children between the ages of 0 to 30 months were identified and randomly assigned to groups as of July 1, 1990. The following section describes the recruitment and random assignment procedures for the study. Demographic characteristics of children and families in each group are also summarized.

Recruitment. Subjects were identified through referrals from the LSU Eye Center and from pediatricians and ophthalmologists in the New Orleans area. Children who were identified as potential subjects were screened by either the site liaison or a teacher and therapist. Each child was classified according to visual acuity, presence of other disabilities, and developmental level as follows.

Visual acuity: 1 = blind (≤ 20/2400)
2 = severely impaired with correction (≤ 20/900)
3 = mildly or moderately impaired (≤ 20/200)

Handicapping condition: 1 = no other handicapping condition
2 = presence of one or two mild handicaps
3 = more than two mild or severe handicaps

Developmental level: 1 = no more than a 33% delay in motor or socio-communication/cognitive areas
2 = more than 33% delay in either motor or socio-communication/cognitive areas
3 = more than 33% delay in both motor and socio-communication/cognitive areas

The presence of an additional disability was determined by the clinical judgment of qualified motor therapist and/or communication disorders specialist. Developmental level was obtained through the use of a screening instrument that consisted of selected items from the Early Intervention Developmental Profile (Brown et al., 1981). Children were eligible for inclusion in the study if the vision impairment was the major disability and the delays were due primarily to their vision impairment. Children who had more than two other disabilities and who had more than a 33% delay in both motor and socio-communication/cognitive areas were not eligible for enrollment in the study.

As seen in Table 1.2, approximately 2/3 of the subjects had mild vision impairments (between 20/200 and 20/900), with the remaining 1/3 distributed in moderately and severely visually impaired groups. The majority of subjects for both groups were rated as having no additional disability and/or significant developmental delay.

Table 1.2

LSU VI Intensity Study Subjects' Degree of Vision and Severity of Handicaps

	Low Intensity	High Intensity
Severe Vision Impairment $\leq$ 20/2400	17%	22%
Moderate Vision Impairment $\leq$ 20/900	11%	11%
Mild Vision Impairment $\leq$ 20/200	72%	67%
Handicapping Condition/Developmental Delay:		
No additional handicap/ developmental delay	67%	56%
1-2 mild-moderate handicap/ developmental delay	33%	44%

The most frequently-occurring causes of vision impairment for subjects were optic atrophy (10%), retinopathy of prematurity (31%), and albinism (17%); other etiologies were present in smaller numbers.

Assignment to groups. After receiving a signed informed consent form from parents, children were randomly assigned to groups stratified by visual acuity, and a combined score for disability and developmental level. (Refer to the EIEI 1986-1987 report for a more detailed description of the assignment procedures). An initial group of 15 children identified during screenings in the first two weeks of February were rank-ordered by age within the cells. A random assignment pattern was determined for each cell by a computer-simulated four-sided die. Children were assigned based on this pattern within cells. Children who were identified after that date were placed in the appropriate cell and assigned according to the assignment pattern.

Demographic characteristics. Demographic pretest data on all subjects enrolled as of July 1, 1990, are reported in Table 1.3. The population from which children were drawn was about 80% Caucasian and had a high degree of variability with respect to socioeconomic status. Although not statistically significant, there were some differences between groups (e.g., percent receiving public assistance, with more subjects in the high intensity group receiving assistance; hours per week the mother is employed, with mothers in the low intensity group working more hours; and percent of children in daycare, with more children in the high intensity group being in extended care). Some demographic data related to the father are missing due to single parent families with estranged fathers.

Subject attrition. Four subjects dropped prior to the collection of Year 1 posttest data; three subjects were dropped from the study based on the parent's decision to no longer participate, and one subject died following prolonged hospitalization. Thus, there were 31 active subjects at Posttest #1. One parent temporarily dropped from participation at Posttest #2, and one subject could not be located; thus, there were 29 active subjects at Posttest 2 time. As of Posttest #3, the formerly lost subject was relocated, though a different family moved without leaving a forwarding address or phone number. Additionally, two families have

Table 1.3

Comparability of Groups on Demographic Characteristics for NO/VI Intensity Study: All Subjects Enrolled by August 1, 1990

	Low Intensity			High Intensity				
	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p Value	ES^
• Age of child in months at pretest	14.5	(10.0)	17	12.3	(11.7)	18	.57	-.22
• Age of mother in years	25.5	(4.3)	17	27.3	(6.5)	17	.36	.42
• Age of father in years	31.4	(8.7)	15	33.3	(10.4)	16	.60	.22
• Percent Male*	41%		17	56%		18	.44	.25
• Years of Education–Mother	13.0	(1.8)	17	12.9	(2.6)	18	.94	-.06
• Years of Education–Father	13.3	(2.9)	14	13.1	(3.1)	17	.88	-.07
• Percent with both parents living at home	71%		17	83%		18	.43	.26
• Percent of children who are Caucasian*	76%		17	83%		18	.66	.15
• Hours per week mother employed	16.9	(18.9)	17	7.8	(15.9)	18	.13	-.48
• Hours per week father employed	40.8	(15.7)	10	39.3	(19.5)	16	.83	-.10
• Percent of mothers employed as technical managerial or above*	35%		17	11%		18	.12	-.50
• Percent of fathers employed as technical managerial or above*	38%		13	53%		15	.49	.25
• Mean total household income+	$25,265	($17,316)	17	$27,139	($27,649)	18	.81	.11
(median)	$25,000		18	$13,000		18		
• Percent with mother as primary caregiver*	82%		17	89%		18	.64	.15
• Percent of children in day care more than 5 hours per day*	47%		17	18%		17	.09	-.56
• Number of siblings	.7	(.9)	17	.8	(.8)	17	.69	.12
• Percent with English as primary language*	100%		17	100%		18	1.00	0.00

---

^ Effect Size (ES) is defined here as the difference between the groups (expanded minus basic) on the $\bar{x}$ scores divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size). The positive or negative sign of the ES only indicates direction of difference; no value judgement is intended.

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored at "0."

+ Means and standard deviations for this variable were estimated from categorical data.

refused participation due to family strains; however, they may be willing to participate in Posttest #4.

Data for key demographic and pretest variables for those who remained in the study and those who dropped out of the study prior to the collection of Posttest #1 data are reported for children in each group in Table 1.4. As can be seen, those who dropped out from each group are quite similar to those who remained, except for the income variable. Since so few children have dropped out of the study, the test of statistical significance is not particularly meaningful, even though it is recorded in the table. These data seem to suggest, however, that attrition which has occurred thus far has not substantially effected the results of the study.

Table 1.4

New Orleans VI Intensity Study Attrition Comparison

		Group						ANOVA				
		Low Intensity			High Intensity			Group		Study Status		Group by Status
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ES^	p Value	ES^	p Value	p Value
CA at Pretest	IN	15.2	(9.8)	16	14.1	(12.5)	13		.62		.12	.47
	OUT	3.5	(.7)	2	9.8	(8.8)	4					
Total PSI	IN	224.4	(35.0)	16	210.4	(21.1)	13	.29	.97	.18	.80	.31
	OUT	213.5	(12.0)	2	228.5	(32.9)	4					
Education Mother	IN	13.1	(1.8)	16	12.8	(2.7)	13	-.09	.92	.29	.52	.70
	OUT	12.0	(0.0)	2	12.5	(1.7)	4					
Education Father	IN	13.4	(3.0)	13	13.1	(3.4)	11	-.14	.53	.48	.49	.67
	OUT	13.0	(1.4)	2	11.5	(1.0)	4					
Income	IN	$24,500	($17,585)	16	$28,885	($27,910)	13	-.01	.58	.55	.37	.33
	OUT	$22,250	($17,324)	2	$ 9,500	($ 4,950)	4					
FRS	IN	131.9	(10.5)	15	111.3	(22.6)	13	-.49	.03	.13	.20	.79
	OUT	140.5	(5.0)	2	124.3	(21.7)	4					
Hours Daycare	IN	3.5	(3.9)	13	1.6	(2.9)	11	-.60	.02	-.56	.06	.12
	OUT	12.0	(17.0)	2	2.5	(5.0)	4					
BDI Total DQ	IN	73.0	(26.2)	16	60.0	(27.3)	13	-.39	.98	.71	.11	.33
	OUT	63.0	(53.0)	2	69.2	(36.0)	4					

^ Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the x scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

Intervention Programs

The alternative interventions were designed to be weekly individualized home-based intervention versus parent group meetings that were held approximately 12 times per year. A detailed description of the treatments follows.

High intensity weekly individualized treatment. The more intensive intervention for 0- through 30-month-old subjects consisted of home-based parent-infant sessions in which parents or primary caregivers and their children were given a systematic program individualized to meet the needs of the family as well as the child.

A home-based intervention as the high intensity treatment was chosen for use in this study for several reasons. Home-based programs serving young children who are disabled or at-risk are one of the most typical intervention models in the field (Halpern, 1984). Philosophically, there are numerous advantages to a home-based intervention and the involvement of the family. Some of the earliest advocates of home-based intervention, Shearer and Shearer (1976) argued that home-based intervention was good because:

> (1) Learning occurs in the parent and child's natural environment.... (2) There is direct and constant access to behavior as it occurs naturally.... (3) It is more likely that learned behavior will generalize and be maintained.... (4) There is more opportunity for full family participation in the teaching process.... (5) There is access to the full range of behaviors.... (6) Training of parents, who already are natural reinforcing agents, will provide them with the skills necessary to deal with the new behaviors when they occur.... and (7) Because the home teacher is working on a one-to-one basis with the parents and child, individualization of instructional goals for both is an operational reality. (pp. 336-337)

There are also practical advantages to home based intervention. For rural or low-income families, travel to a center location is often difficult. Additionally, some children have medical needs that make leaving the home difficult (Bailey & Simeonsson, 1988). In spite of these theoretical and practical justifications for home-based intervention, previous research has provided very little evidence about the effectiveness of home-based intervention, particularly for children with visual impairments.

All infants/toddlers in the individualized treatment group were scheduled for an average of 1 hour of intervention services weekly. The activities incorporated daily routines, such as feeding, diapering and changing, as well as familiar toys and household items. In three instances, it was necessary for families to travel to the program center for intervention services. The travel expenses for these families were covered through program funds.

The model of intervention was consistent with the guidelines set forth by P.L. 99-457 for serving the families of children ages birth through 3 years of age. A case manager coordinated the services for the family. The case manager was typically the education specialist, this varied in accordance with the characteristics of the child and family. Individualized Family Service Plans were developed to meet needs of the child and family.

The person with primary caregiving responsibility for the child at the time was the active participant in the session. In instances in which a parent was not the primary caregiver during program intervention sessions, every effort was made to share information with them in telephone contacts and other visits. For example, one child attended a regular preschool, 5 days a week, and the program teacher provided services there. Meetings were held between program staff, preschool staff, and the parent to discuss and plan strategies and exchange information. All parties were pleased with this pattern of service delivery, which appeared to be the most natural setting for this child.

The degree of caregiver involvement in any one session was individualized according to the needs and skills of the caregiver. The role of the intervenor during the sessions may have been assumed almost entirely by the caregiver, with the program teacher guiding and giving feedback. In other instances, the program teacher demonstrated while the caregiver observed. In most sessions, there was a combination of these patterns. New activities were generally first introduced by the program teacher, who then instructed the caregiver in implementing the activity. Parents were involved in implementing stimulation activities, collecting data, and charting behavior in the home between sessions.

In addition to focusing on specific needs of the individual infant/toddlers, the needs of the family in relation to the child were addressed. Treatment reflected the family's needs in regard to interacting with the child, developing their general knowledge of visual impairments, and improving their skills in encouraging their child's development. Needs for assistance or guidance in obtaining community services such as medical or daycare services for their child were also addressed.

The Louisiana Curriculum for Infants with Handicaps, which was developed by the staff of the Human Development Center, formed the basis for development of intervention activities for this program. The activities in the curriculum take into account the total child and the interactive nature of development across domains. The curriculum was augmented with strategies addressing visual impairments.

Activities (lessons) were developed for the domains of gross motor, fine motor, cognition, self-help, social-emotional, and communication. Information with each lesson included: area, goal, rationale, materials, cautions, teaching procedures, teaching notes, and evaluation criteria. A data collection system was used by parents and program staff for charting children's progress. A Curriculum Placement Instrument (CPI) for each domain was used for choosing activities appropriate for the status of child and family. Modifications were made in specific activities in the curriculum, in consultation with the professional staff, to adapt them to the child's needs and as appropriate for the child's vision.

In addition to the observation and modeling provided by the program teacher, parents were provided instructions on how to implement a specific lesson and the type of weekly data to be collected. Often parents requested information on a particular topic related to visual impairment or child development. The home intervenor provided supplemental information from the Reach Out and Teach curriculum (Ferrell, 1986). This is a manual designed to provide parents with information about visual impairments and appropriate general stimulation activities.

During 1987-1988, the education specialist was the primary contact person working closely with the parents or other caregivers to provide the intervention. The education specialist planned sessions and activities, guided interventions, collected data, maintained attendance records and individual child folders, and coordinated consultations and direct services from other professionals. These two education specialists were certified teachers experienced in serving young children with special needs. The speech therapist, occupational therapist, physical therapist and social worker from the Human Development Center at Louisiana State University assisted in meeting needs of the participating infants/toddlers and their families. All children were seen, initially, by at least one of these specialists in the screening process. Depending upon the impairments of the child and needs of the family, the specialists were called upon for consultation with the program teacher and/or parents, or for provision of direct services. For example, the speech therapist might have assisted the teacher to design a turn-taking routine and the OT and PT might have provided direct services for children with gross and fine motor problems. During 1988-1989, the role of the social worker was expanded to provide more direct intervention with families. The social worker maintained close contacts with the families, interacting with them 1-2 times per month. In fact, often the social worker was the case manager.

A certified teacher of the visually impaired supervised the home interventions and offered programming suggestions. Intervenors were certified special education teachers. As noted by Siberman, Corn, and Sowell (1989), most states have deemed it appropriate to deliver services to children with visual disabilities by having generically trained teachers who are supervised by someone who is certified as a teacher of the visually impaired. Indeed, this model is used with the majority of children with visual impairments.

Low intensity parent group treatment. Families in the low intensity control group were offered services in the form of group meetings which were held approximately 12 times per year for roughly one hour each. During 1987 and the majority of 1988, parent group meetings were conducted about twice monthly for approximately 9 months out of the year. Due to staff and funding changes, meetings in 1988-1989 were rescheduled to be held in two sessions, each session consisting of 6 weekly meetings. Although informal, there was always a specific topic for discussion, with readings assigned and time for questions and answers. Slides and tapes developed for use with Reach Out and Teach had also been used. After an introductory meeting, appropriate professionals attended the meetings to discuss cognitive development, social skills, and temperament. Presentations focused on the effects of visual impairment on these various areas of development with general suggestions for compensation. General stimulation activities were suggested, but no individualized treatment plans or activities were provided.

After each presentation by a professional, parents were given time to ask specific questions and discuss issues of concern to them. These sessions also functioned as a support group, whereby parents with older children who were visually impaired offered support and information to the parents of younger children.

Treatment Verification

The following procedures were used to verify that treatment was implemented as intended.

Collection of attendance data. Parent and child participation in the individual sessions, as well as parent involvement in group meetings, were recorded according to length of session and staff involved. Non-attendance at regularly scheduled sessions was also recorded according to the reason for non-attendance (e.g., child illness, vacation etc.). Attendance data are summarized in Table 1.5 for subjects included in Posttest #1.

Table 1.5

Treatment Verification Data for LSU/VI Intensity Study: Report of Services Received Between Pretest and Posttest #1

	Low Intensity			High Intensity			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	SD	n	p Value
• Average length of intervention in months	12.7	(2.0)	17	12.3	(.5)	14	.46
• Total number of hours of parent meetings	3.4	(3.9)	16	29.2	(8.8)	13	.00
• Total number of hours of individual intervention	---	---	16	---	---	14	.00
• Intervenor's rating of parent involvement with intervention (range 0 to 45)	N/A	N/A	N/A	31.8	(6.1)	12	---
• Receipt of additional therapeutic services outside of assigned intervention							
% receiving Speech/Language therapy	6%			29%			.13
% receiving motor therapy	12%			29%			.29
% receiving daycare	53%			21%			.57
% receiving preschool	6%			31%			.13
• Evaluation of intervenors (range 0 to 30)	24.2			26.0			
• Parent satisfaction with services (range 0 to 4)	3.7	(.5)	7	3.7	(.5)	12	.996

As can be seen, the amount of intervention received by each group was substantially different. In addition to the differences and number of hours of intervention received, the types of interventions were diverse. In the high-intensity group, each hour of intervention included individualized, specifically focused developmental activity; whereas in the low-intensity group, the hour of intervention consisted of general discussion around issues such as developmental milestones and facilitative strategies. Consequently, The study closely resembles a treatment versus no-treatment comparison.

Parent involvement in the home. Various strategies were used to measure parent report of time spent working with their child for those in the weekly intervention.

However, accurate information was difficult to obtain, primarily due to the naturalistic learning and teaching approach of the program. Since the intervention in the high-intensity group stressed incidental learning activities to be integrated into the parent and child's daily routine, a discrete measure of time was not meaningful. Therefore, in lieu of a parent report of time, the intervenors rated the parents using a 9-item, 5-point Likert-type scale on their ability to integrate program suggestions at home. Examples of behaviors rated include the parent's ability to facilitate communication, encourage child to use functional vision, respond appropriately to child's initiation. The mean score for the high intensity group reflected moderate to good ability of parents to integrate home activities (see Table 1.5). Since parents in the low intensity group were not expected to be involved in incidental teaching with their children, and no instructions were given to them as to how to be involved in such teaching, no measures were taken on this variable for the low intensity group.

Additional services. Given this experimental design, it was important to document any additional services that subjects in either group may have received. There were few, if any, other services available, if parents were able to pay for them, in the study's geographical area designed to specifically treat children who are visually impaired. However, there were other services available for children with developmental delays. Parents could have accessed motor and/or communicative disorders specialists, though this was expensive. The Children's Hospital also provided such therapies to families who were receiving public assistance. Although there were other infant programs, these did not specialize in serving children with visual impairments. Parents were not restricted from obtaining additional services, though it was unlikely that many such services would be obtained given the lack of opportunities.

To collect information about additional services, parents provided information via an interview with the assessment supervisor regarding any services that were obtained outside of the research program between Pretest and Posttest #1. Based on these data, few subjects received a substantial amount of additional therapeutic services (see Table 1.5). Subjects in the high intensity group reported the receipt of significantly more preschool or daycare hours. In many cases, it was difficult to differentiate center-based daycare from a preschool program. If these services are combined, 60% of children in the low intensity group had no daycare/preschool, and 54% of the children in the high intensity group had no daycare/preschool; this makes the two groups highly comparable.

Additional services data were also collected between Posttests #1 and #2. Many of the subjects turned three years of age after Posttest #1, and no longer participated in the original birth-to-three intervention to which they were assigned. Additional services data are only relevant for subjects under three years of age for the purpose of determining any contamination of the two interventions in question.

Information on subjects given between Posttest #1 and Posttest #2 indicates that subjects in the high intensity group averaged slightly more additional services (see Table 1.6). It is worthwhile to note that the percentage differences represent few subjects. One high intensity subject received speech and language therapy. The differences in the daycare percentage (83% versus 67%) translates to one more high intensity subject. There were three high intensity subjects and one low intensity subject involved in a preschool program. Again, it appears the overall differences between groups receiving additional services is not significant. Any small bias which exists is in favor of the high intensity group.

Parent satisfaction. Given the important role that parents play in receiving services and providing intervention to their children, rating scales were developed to record parent's satisfaction with the services they were receiving based on their group assignments as well as the service provider's impression of the parents' levels

Table 1.6

Treatment Verification Data for LSU/VI Intensity Study:
Receipt of Additional Services Outside of Assigned Intervention Between Posttest #1 and Posttest #2

Variable	Low Intensity $\bar{x}$	High Intensity $\bar{x}$	p Value
• Receipt of additional therapeutic services outside of assigned intervention			
% receiving Speech/Language therapy therapy	0%	17%	.43
% receiving motor therapy	12%	17%	.81
% receiving daycare	25%	33%	.75
% receiving preschool	25%	50%	.42

of knowledge, attendance, and support. Both forms were completed at posttest time. All obtained information was kept confidential. As shown in Table 1.5, parents from both groups report high satisfaction with the intervention in which they participated.

Evaluations of intervenors. To assist in determining the quality of the intervention, ratings and rankings of the interventionists from both groups were conducted internally by program supervisors, as well as externally by the project site coordinator and an independent reviewer. The program supervisors provided information about the quality of the intervention via a 5-point rating scale in the areas of skills, problem solving, work habits, relationships, communication, and attitude. The average score for the intervenors in the high intensity group was 24.2, from a possible total 30 points. There was only one intervenor in the low intensity group, and she received a total score of 26 out of 30. All intervenors were then compared to professionals in similar positions and rated in either the top 10%, top 25%, top 75%, or bottom 25%. Four of the six intervenors in the high intensity intervention were rated in the top 10%, and the remaining two were rated in the top 25% of their peers. These results reflect a quality program as viewed by staff at the Human Development Center.

In addition to these measures of treatment verification, a formal on-site review was conducted in December, 1988, by the site coordinator. Based on observations of home intervention sessions, reviews of records, and interviews with staff, the program was providing the services as required for the study. A detailed report is available for more specific information.

Dr. Kay Alicyn Ferrell, a well-respected authority on serving young children with visual impairments, provided an independent assessment of the program's ability to meet the unique needs of this population. This independent evaluation occurred in October, 1989. Dr. Ferrell rated the program highly in the area of general assessment procedures, supplementing standardized testing with observations of the child in the natural environment. She noted that attention to functional vision assessment and orientation and mobility assessment could be improved. She also suggested that more attention be given to the development of formal lesson plans and data collection, although the intervenor's records did provide good anecdotal information. IFSP development was rated as meeting all the criteria of a high-quality plan, and overall interaction with parents was viewed very positively. Dr. Ferrell stated that she was favorably impressed with the competencies of the staff in early childhood special education.

Dr. Ferrell noted that the intervenors have done an admirable job, and were serving visually impaired infants and their families far better than some agencies with trained specialists. Dr. Ferrell stressed that the presence of professionals certified in visual impairment alone does not necessarily equate to an appropriate early intervention program. Expertise in early childhood development and family intervention may be of greater importance to an intervention such as this. The evaluation report in its entirety is available for review upon request.

Contextual Variables Which May Have Affected Results

Data were collected to determine the occurrence of other factors beyond the control of the experimenter which could potentially impact outcome. A comparison of the low versus high intensity groups on such factors follows.

Child health data. Parents completed a self-report questionnaire inquiry about their child's health over the past 12-month period. Quantitative information (e.g., the number of days hospitalized, number of ear infections, etc.) was gathered as well as a qualitative rating of the child's overall health compared to others of the same age. As shown in Table 1.7, no statistically significant differences were found in comparing the health of low versus high intensity children at Posttest #1, #2, or #3.

Table 1.7

Disruptive Occurrences as Measured by the Family Inventory of Life Events and Changes at Posttests #1, #2, and #3

	Low Intensity				Low Intensity						
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	ANCOVA F	p Value	ES
Posttest #1											
FILE	7.2	(4.5)	55	17	10.1	(9.0)	40	13	.40	.54	-.42
% no hospital	77				69					.67	.15
% no infections	100				100					1.00	.00
General Health	1.9	(.5)		17	2.0	(.7)		13		.59	.20
Posttest #2											
FILE	6.4	(3.3)	69	15	10.4	(9.2)	40	11	1.80	.19	-1.52
% no hospital	73				91					.39	.32
% no infections	93				100					.72	.13
General Health	2.1	(.5)		15	2.3	(.5)		11		.27	.40
Posttest #3											
% no hospital	91				100					.72	.15
% no infections	82				100					.44	.33
General Health	2.3	(.5)		11	2.1	(6.4)		8		.57	-.40

Major life events. As previously mentioned, the Family Inventory of Life Events and Changes (FILE) was administered as a core instrument to measure the occurrence of stressful life events. Although the FILE assesses the occurrence of positive as well as negative life events, both are viewed as causing an increase in stress. Therefore, any differences in the amount of life events between groups may influence the study results. As shown in Table 1.7, no statistically significant differences were found between groups at Posttest #1 or #2, and both groups received mean scores in the average percentile range. At Posttest #2, however, the mean score for the high intensity group was slightly higher (although non-significant); this was found to be due to one parent who reported the occurrence of many stressful life events which skewed the means. The FILE was not collected at Posttest #3 due to negative comments from some parents regarding its intrusiveness.

Based on these analyses, there did not appear to be any measured extraneous factors which warranted consideration in the analysis. Subgroup analysis with these data (e.g., poor versus good health) is planned for the future.

Cost of Alternative Interventions

Program costs were calculated using the ingredients approach. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earnings for full-time work" plus benefits (U.S. Department of

Labor, Bureau of Labor Statistics, 1989). As shown in Table 1.8, each alternative used varying amounts of the indicated resources. The following sections describe the resources and costs used for the weekly home visit program and the parent group meetings.

Table 1.8

Cost per Child for LSU-VI Site (1990 Dollars)

Resources	High Intensity (n=15)	Low Intensity (n=15)
1. **UNDISCOUNTED**		
Agency Resources		
Direct services	$3,942	$ 269
Administration		
program	1,620	175
university	702	60
Occupancy	321	9
Equipment	125	9
Transportation	108	0
Materials/supplies	79	20
Telephone	75	1
Sub Total	$6,272	$ 543
Contributed Resources		
Direct services	0	16
Parent time	234	232
Parent transportation	428	115
Sub Total	$ 662	$ 363
Total	$6,934	$ 906
2. **DISCOUNTED (3%):**		
Agency Resources	$6,854	$ 592
Total Resources	7,577	989
3. **DISCOUNTED (5%):**		
Agency Resources	$7,261	$ 627
Total Resources	8,027	1,048

* Totals may not add up due to rounding errors.

Analysis of the cost data for the LSU VI project reflects the per child costs for the individualized, weekly home-visit intervention versus the low intensity parent group intervention. These data were collected in June of 1988 and are adjusted for inflation to 1990 dollars. The total cost at discount rates of 3% and

5% are presented at the bottom of Table 1.8. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time. Since there had not been any major changes in the interventions, cost data were not collected each subsequent year.

Cost of high intensity, weekly home-visit intervention. Salaries and benefits for direct service and administrative personnel were determined according to their FTE devoted to this aspect of the project. Direct service personnel included two teachers, an occupational therapist, a speech therapist, a physical therapist, a social worker, a developmental pediatrician, and a temporary home-based teacher hired for three months on a consulting basis. Administrative personnel included the program director, the principal, and a secretary. University administration was calculated using the LSU indirect rate of 12.6% for general, departmental, and sponsored projects administration. Parent time was required for participation in home visits, special sessions with the therapists, and for programming assessments. The opportunity cost of parent time ($9/hour) was applied to the average time (23.2 hours) each parent spent in the home-based visits during 1987-88. However, the actual value of parent contributions is probably much higher in this program than it appears since the majority of parent contribution was involved via incidental teaching strategies that are difficult to measure quantitatively. Thus, the actual estimation of value of parent time is most likely an underestimate of what the parents actually contributed.

Occupancy charges, including space, maintenance, utilities, and insurance costs, are based on office leasing costs in the area. Nine dollars per square foot was applied to the 478 square feet used by the program (also pro-rated according to FTE). Annual equipment cost was determined by taking inventory of all instructional materials, office furniture, and equipment. Market replacement values were then applied to each item, costs were annualized accounting for interest and depreciation, and pro-rated according to the percent FTE worked on the project. Staff travel was based on actual mileage (at $.21 per mile) for home visits. Several parents were reimbursed for travel to the center for weekly intervention services. For parents who were not reimbursed, information was collected via telephone interview on the number of trips made to the center, the round-trip distance, and the approximate time spent in travel. Parent transportation costs were then calculated based on $.21 per mile and the opportunity cost of parent time ($9/hour) spent in travel. The cost of materials, supplies, and telephone charges were assessed based on actual usage of these items.

Cost of low intensity, parent group meetings. Direct service costs for the low intensity parent group meetings involved compensation for the group leader on a contractual basis. Various professionals assisted the group leader in addressing specific topics on a volunteer basis. The opportunity cost of their time was determined at $25 per hour for 9 hours. Program administrative cost included a small portion of the site liaison's FTE. University administrative cost was based on the indirect rate as explained above. Parent costs included time spent in the group meetings (based on average attendance), as well as time and expenses associated with travel to the meetings (parent travel information was obtained for this group also by telephone interview). Occupancy cost, calculated at $9 per square foot, (for 47 square feet, pro-rated according to usage by the program) was calculated for the group meeting room at the LSU Eye Center and the site liaison's office. Equipment costs for the group meetings include instructional/curricular materials (Reach Out and Teach) and office equipment and furniture which was valued, annualized, and pro-rated according to FTE. Finally, telephone and materials and supplies costs were assessed based on annual actual usage.

Data Collection

Data on children and their families was collected using instruments selected to yield descriptive information (i.e., demographics) as well as assess treatment effects. A description of diagnostician requirements is described below, followed by descriptions of the pre- and posttest instruments for this study (refer to Tables 1.9 and 1.10 for summary and descriptions of measures).

Recruitment, training, and monitoring of diagnosticians. All testers recruited for the study successfully completed the certification process required for administration of the Battelle Developmental Inventory. The training involved approximately 4 hours of independent study, 8 hours of group training, and a minimum of 3 practice administrations with 85% interrater agreement required. From the beginning of the study in 1987, through 1989, testers were recruited through the Human Development Center (HDC) at Louisiana State University. As of January, 1990, testers were recruited from the Special Education Department at the University of

Table 1.9

Schedule of Administration and Tests Administered for New Orleans Visually Impaired Study

	Pretest	Posttest #1	Posttest #2	Posttest #3	Posttest #4
CHILD MEASURES					
Battelle Developmental Inventory	X	X	X	X	X
Videotaped Scenario of Exploration Play			X		
Early Intervention Developmental Profile		X			
Vineland Adaptive Behavior Scales				X	X
Carolina Record of Individual Behavior		X			
Boehm Test of Basic Concepts					X
FAMILY MEASURES					
Parenting Stress Index	X	X	X	X	X
Family Support Scale	X	X	X	X	X
Family Resource Scale	X	X	X	X	X
Family Inventory of Life Events and Changes	X	X	X		
Family Adaptation and Cohesion Scales	X	X	X	X	X
Videotaped Scenario of Parent/Child Interaction		X	X	X	

Table 1.10

Description of Tests Administered for New Orleans Visually Impaired Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
The Boehm Test of Basic Concepts--Form A (Boehm, 1971) The Tactile Analog (Caton, 1976)	This instrument is designed to measure children's mastery of concepts considered necessary in kindergarten through second grade. The BTBC consists of a series of 50 picture items and could easily be used with many low vision children. The TTBC is composed of 50 plastic sheets on which 50 items of the BTBC are presented in raised outline drawings. Internal consistency and content validity are reported to be sound.
The Vineland Adaptive Behavior Scales--Survey Edition (Sparrow, Balla, and Cicchetti (1984)	This version provides a general assessment of adaptive behavior, covering the domains of communication, daily living skills, socialization, and motor skills. It is administered to a parent or caregiver in a semistructured interview format. It is appropriate for use with persons ages birth to adult. Standard scores and age equivalents are obtainable. Norms for special populations (i.e., visually impaired) are also provided. Interrater reliabilities, internal consistencies, and concurrent validity data strongly support its use.
Videotaped Scenario of Exploration/Play (E.I.R.I.)	A standard protocol was developed by EIRI to assess exploration and independent play behaviors in children with visual impairments. Based on a review of the literature, standard toys were selected. The protocol lends itself to use with various systems (i.e., Fewell, Belsky). This assessment provides information on the child's use of senses and an estimate of cognitive development in a nonthreatening, child-directed manner.
Forced-Choice Preferential Looking Technique	This is a newly-developed acuity test of young children 1 to 36 months, developmentally. It has been proven useful with difficult-to-test children, and those who are unresponsive to traditional acuity measures. During the testing, the child is shown a stimulus display containing a black-and-white grating on one side and a homogenous gray target on the other. Acuity is determined according to the stripe width to which the child fixates. It has been shown to successfully estimate acuity in 95% of study sample.
The Carolina Record of Individual Behavior (Simeonsson, 1981)	This instrument is a rating of variables related to the child's interaction with the environment, a key focus of the high intensity intervention. Ratings are based on the diagnostician's clinical impressions when administering the EIDP. Sound test-retest reliabilities are reported as well as some degree of construct validity.
The Early Intervention Developmental Profile (Brown et al., 1981)	This is a criterion and age-referenced instrument that assesses all major areas of development with an emphasis on sensorimotor intellectual markers. It has 299 items broken down into small age ranges. The manual reports strong concurrent validity with other standardized measures as well as strong interrater and test-retest reliabilities.
Videotaped Scenario of Parent-Child Interaction	A standardized protocol was developed by EIRI which would lend itself to various methods of evading parent-child interaction. A 20-minute routine included free play and a structured activity (storytelling), as well as parent-child separation and reunion.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.

(continued)

Table 1.10 (continued)

Description of Tests Administered for New Orleans Visually Impaired Study

MEASURES	DESCRIPTION
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.

New Orleans. All of the diagnosticians had bachelor's or master's degrees and extensive experience assessing infants and children with disabilities, including visual impairments. All the testers were naive to the subject assignment. Shadow-scoring was conducted on 10% of the BDI administrations, averaging 93% interrater agreement. While working with the HDC, an assessment supervisor with a master's degree in special education coordinated the scheduling of the testing, collected the family measures, and ensured the quality of the test results via tester reliability checks and double-checking protocols. Since 1990, Dr. David Slade, a professor with the Special Education Department, has fulfilled the role of assessment supervisor.

Pretest. After children were identified and assigned to groups based on their visual acuity and screening results, a pretest battery consisting of the Battelle Developmental Inventory (BDI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III), were administered. (Specific psychometric information regarding these measures can be found in the EIEI 1986-87 annual report.) Demographic information was also obtained via interview with the parent. These measures were considered as potential covariates in the analysis as well as to investigate whether certain types of families or certain types of children benefit more from intervention.

The BDI was administered by a trained diagnostician who was unaware of the child's group assignment. Testing occurred at the Human Development Center in New Orleans, ensuring that the testing setting was the same for all subjects.

The family measures were completed by the parent attending the testing session following the administration of the BDI. Married parents and those with spouse equivalents were also given a copy of the FSS to take home for their partner to complete. To encourage and reinforce parent participation in the assessment process, parents were paid a monetary incentive of $20 for completing the pretest battery. The diagnostician scored the BDI and completed a testing report. The diagnostician did not score the family measures. All data were then transmitted to the assessment supervisor. The assessment supervisor maintained copies of all of the protocols for the on-site records and submitted the original protocols via certified mail to the EIRI site coordinator who supervised checking of the accuracy and completeness of the protocols, scoring of the family measures, and entering the data into the computer.

Posttest #1. Posttest measures were collected after children were in the program for 12 months. These included the Battelle Developmental Inventory and the family measures previously described. In addition, the Early Intervention Developmental Profile (EIDP) (Brown, et al., 1981) the Carolina Record of Individual Behavior (CRIB) (Simeonsson, 1981), Assessment of Preferential Looking, and videotaped assessment of parent-child interaction were collected. Parents were again paid to compensate them for their efforts (refer to Table 1.10 for a description of these measures).

The EIDP was administered in conjunction with the BDI, with identical items being scored based on the child's BDI performance and unique items being administered following the BDI administration. A separate diagnostician, also naive to subject assignment, administered the EIDP. The Carolina Record of Individual Behavior (CRIB) was completed on each child based on the BDI diagnostician's clinical impressions when administering the EIDP.

Forced Preferential Looking (Teller, Morse, Boston, & Regal, 1974) was conducted at both pre- and posttest time through the LSU Eye Center. The pretest preferential looking test was used to stratify according to acuity for group assignment. Preferential looking was also conducted as a posttest measure in order to monitor any changes in vision which may impact test results. As the children grew older, traditional acuity tests (e.g., Lighthouse cards) were used.

Videotaped assessment of parent-child interaction was used to measure the effects of intervention on parent-child relationships. This was considered to be an important outcome given the dramatic differences in the two treatments being compared. This information can potentially provide further insight into the effects of a visual impairment on parent-child relationships.

Three coding systems were piloted to code the tapes, each using a slightly different approach to analysis. The Parent/Caregiver Involvement Scale (Farran, Kasari, Comfort, & Jay, 1986), rates maternal behavioral descriptors on a 5-point scale across three dimensions: amount, quality, and appropriateness. Global ratings of (1) availability of parent to child, (2) general acceptance and approval manifested by parent, (3) general atmosphere, (4) enjoyment, and (5) provision of learning environment. All of the Posttest #1 tapes have been coded using this system. The Parent-Child Behavioral Observation System (Marfo, 1989) examines behavior as a dynamic process, measuring both child and parent behaviors and how they interact. Eighty percent of the tapes have been coded by Marfo. The Parental Behavior Rating Scale (Mahoney, 1988) rates 12 parental behaviors (warmth, expressiveness, enjoyment, acceptance, sensitivity to child's interest, responsivity, effectiveness, directiveness, achievement, orientation, paces, inventiveness, and verbal praise) which are divided into three factors of (1) affective relationship with child, (2) orientation responsivity to child, and (3) performance orientation. Ratings are based on a 5-point Likert-type scale.

These measures provide information which is useful in establishing the comparability of the two intervention groups as well as providing information to investigate whether certain types of families or children benefit more from the intervention procedures.

Posttest #2. The posttest measures used during Year 2 include the BDI and the previously described family measures. Complementary measures include the assessment of preferential looking and two videotaped assessment procedures. The previously-described videotaped assessment of parent-child interaction was also collected during Year 2 posttesting. In addition to assessing group differences, this measure was repeated with the intention of providing insight into the impact of a visual impairment on later parent-child interactions.

A standardized videotape procedure for assessing exploration and play was also used for Posttest #2. Both exploration (the skills used to obtain information about novelties in the environment) and play (involving the application of information obtained through exploration) are outcome measures that are not assessed through traditional assessments, and yet are behaviors that have been closely related to cognition, language, and social development. Learning through exploration and play are strategies emphasized by the high-intensity, weekly intervention group. The Play Assessment Scale (Fewell, 1986) was used to analyze the exploration/free play videotaped scenarios.

By the time of Posttest 2, many families had relocated out of the original catchment area, making it difficult for families to come to a central testing area. For this reason, the location of some families necessitated testing in their homes. However, testers made every effort to ensure that there was a structured atmosphere.

It is also worth noting that parents reported preferring the home setting due to their children feeling more comfortable with the familiar environment.

***Posttest #3*.** The posttest measures used during Year 3 include the BDI and the previously described family measures. Additionally, the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984) were selected to obtain a more detailed estimate of the child's ability to function independently. The items on the Vineland tend to be less vision-oriented; in fact, norms for children with visual impairments are provided. The parent-child interaction data was continued, with age appropriate toys added. To date, 18 children have received Posttest #3 battery, as per their date of enrollment in the study. Due to the lack of complete subject data, these results will not be reported until October 1991.

***Posttest #4*.** The posttest measures used at four years from enrollment include the BDI as well as the Vineland Adaptive Behavior Scales. In addition, the Boehm Test of Basic Concepts (Boehm, 1971) was used to assess concepts requisite for school success. The Boehm stimulus materials lend themselves to enlargement for low vision children; there is also a tactile analogue to the Boehm which is appropriate for totally blind children. The Parenting Stress Index, the Family Resource Scale, the Family Support Scale, and the Family Adaptability and Cohesion Evaluation Scales III are also part of the Posttest #4 battery. To date, 14 children have completed the Posttest #4 battery due to the staggered enrollment into the study. It is anticipated that a sufficient amount of Posttest #4 data will be collected and analyzed by September, 1992.

Results and Discussion

The following section presents results of the study with respect to comparability of the groups on pretest measures, and the findings regarding the effects of alternative forms of intervention on measures of child and family functioning. To date, the results only pertain to the findings based on Posttest 1 and Posttest 2.

Comparability of Groups on Pretest Measures

Table 1.11 presents comparability of groups for all active subjects. (Scores for the FILE were reported here for the sake of showing comparability at pretest time. However, it was not viewed as an outcome measure.) BDI gross motor and motor total pretest scores are statistically significantly higher for the low intensity group (p = .06 and .10, respectively). In comparing the scores on the family measures between groups, the mean FRS score was significantly lower (p = .02) for the high intensity families; therefore, the FRS was considered as a covariate in the analyses of posttest data.

Given the differences in BDI gross motor and FRS scores among the low versus high intensity group, the variables were used as covariates in the posttest analyses.

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Data are presented for children who have received testing immediately following one year of intervention followed by children who have been tested two and three years from the date of pretest. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical

Table 1.11

Comparability of Groups on Pretest Measures for NO/VI Intensity Study

	Low Intensity				High Intensity					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES[^]
• **Age in months at pretest**	14.5	(10.0)		17	13.1	(12.5)		14	.75	-.14
• **Battelle Developmental Inventory (BDI)**[+]										
Personal Social	39.3	(22.2)		17	32.7	(24.1)		14	.44	-.30
Adaptive Behavior	29.5	(18.5)		17	22.8	(17.2)		14	.31	-.36
Gross Motor	30.5	(18.8)		17	18.3	(14.4)		14	.06	-.65
Fine Motor	13.7	(9.8)		17	10.0	(9.1)		14	.29	-.38
Motor Total	44.2	(27.9)		17	28.3	(23.3)		14	.10	-.57
Communication	24.0	(14.9)		17	18.5	(15.9)		14	.33	-.37
Cognitive	16.1	(11.8)		17	11.4	(8.9)		14	.23	-.40
TOTAL	153.1	(92.9)		17	113.6	(87.3)		14	.24	-.43
• **Parenting Stress Index (PSI) Percentile Rank**[@#]										
Child Related (range 47 to 235)	102.4	(22.5)	60	17	100.6	(16.6)	57	14	.81	+.08
Other Related (range 54 to 270)	120.9	(17.5)	50	17	114.9	(17.8)	40	14	.36	+.34
TOTAL (range 101 to 505)	223.3	(34.2)	53	17	216.1	(29.4)	43	14	.54	+.21
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**										
Adaptation	23.8	(6.0)		17	23.3	(5.6)		14	.82	-.08
Cohesion	39.9	(5.7)		17	40.1	(6.5)		14	.95	.04
• **Family Resource Scale (FRS)**[&%]	131.6	(10.2)	74	17	117.3	(18.4)	48	14	.02	-1.40
• **Family Index of Life Events (FILE)**[$#]	7.9	(5.3)	55	17	10.4	(5.9)	40	14	.24	-.47
• **Family Support Scale (FSS)**[&%]	28.3	(11.5)	52	17	28.6	(10.4)	53	14	.93	-.03

[^] Effect Size (ES) is defined here as difference between groups (high intensity minus low intensity) on $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[+] Statistical analyses for BDI scores were conducted using raw scores for each of the scales.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[#] Statistical analysis and effect size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ES are most desirable.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with children with disabilities).

[$] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

significance at $p \leq .10$, and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977) in those cases where a covariate or set of covariates could be found which correlated with the dependent variable in question (which was almost the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 87% for finding moderate sized differences (defined by Cohen as differences of a half a standard deviation) when analyzing child outcome variables.

Results of Posttest #1. Table 1.12 summarizes the posttest data for both low and high intensity subjects who have received the prescribed intervention for one year. Analyses of covariance were conducted for the BDI raw scores using the gross motor raw score and the Family Resource Scales, as these variables were different for the two treatment groups at pretest time and were highly correlated with outcome variables. Chronological age at pretest was also used as a covariate due to the high degree of variability and its correlation with the outcome measures.

Analysis of the BDI posttest data show that the adjusted means for BDI for gross motor scores were statistically significantly different in favor of the low intensity group ($p = .02$). Adaptive, fine motor, communication, and cognitive domains, as well as BDI total scores, were higher, but not statistically significant (at the $p \leq .10$ level) for the high intensity group. Scores for the Early Intervention Developmental Profile, a criterion-referenced measure, are also reported in Table 1.12, using the Battelle gross motor raw score, the FRS, and chronological age at pretest as covariates. The low intensity group generally scored higher on all domains, except for self care with the gross motor subdomain reflecting statistical significance. The average effect size for these two developmental measures was -.05.

Scores for the Carolina Record of Individual Behavior are reported for selected domains based on the ability to provide unique information as well as those most pertinent to the study. Scores for social orientation (reflects the child's responsiveness to persons in the environment), participation (describes the child's

Table 1.12

Posttest #1 Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj. x	n	$\bar{x}$	(SD)	Adj. x	n	ANCOVA F	p Value	ES[^]
• Average length of intervention in months		12.7	(2.0)		17	12.3	(.5)		14		.46	-.20
• Age in months at posttest		27.9	(9.9)		17	26.1	(13.4)		14		.67	-.18
• **Battelle Developmental Inventory (BDI)**[*]	1,2,3											
Personal-Social		80.4	(30.7)	71.3	17	62.6	(27.9)	71.8	14	.00	.94	+.02
Adaptive Behavior		51.3	(15.2)	46.5	17	44.0	(16.0)	48.8	14	.35	.56	+.15
Fine Motor		26.9	(11.4)	23.9	17	21.1	(9.0)	24.1	14	.00	.95	+.02
Gross Motor		48.8	(10.9)	45.5	17	35.2	(11.7)	38.5	14	5.8	.02	-.64
Communication		42.6	(17.5)	36.7	17	34.5	(14.5)	39.5	14	.19	.67	+.16
Cognitive		30.0	(13.9)	26.2	17	25.4	(13.9)	29.2	14	.54	.47	+.22
TOTAL		279.9	(94.6)	251.0	17	222.9	(89.0)	251.8	14	.00	.97	.00
• EIDP[+]	1,2,3											
Gross Motor		69.6	(18.0)	65.0	17	53.8	(13.3)	58.4	14	3.18	.09	-.37
Fine Motor		36.4	(18.1)	32.5	17	27.8	(12.2)	31.7	14	.03	.86	-.04
Self-Care		38.8	(13.7)	34.9	17	32.8	(12.0)	36.7	13	.34	.57	+.13
Cognitive		37.2	(16.6)	33.0	17	25.8	(11.0)	30.0	14	.61	.44	-.18
Social		37.6	(13.2)	33.5	16	29.5	(11.5)	33.6	14	.00	.98	.00
Language		40.2	(15.6)	34.6	16	26.7	(14.0)	32.3	14	.63	.44	-.15
												$\bar{x}$ ES = -.05
• CRIB	1,2,3											
Social Orientation[&] (range 0-9)		8.1	(1.3)	7.8	17	7.6	(1.6)	7.9	14	.03	.86	+.08
Participation[&] (range 0-9)		6.4	(2.0)	6.0	17	6.1	(2.1)	6.5	14	.32	.58	+.25
Reactivity[@] (range 0-5)		5.3	(.9)	5.5	17	4.9	(.8)	4.7	14	5.2	.03	+.94
Attention[@] (range 0-5)		5.6	(1.0)	5.6	17	5.7	(1.1)	5.8	14	.26	.62	-.20
Responsiveness[@] (range 0-5)		5.1	(.4)	5.0	17	5.1	(.7)	5.1	14	.23	.63	-.23
Negative Affect[$] (range 0-16)		4.4	(3.3)	4.5	17	4.4	(3.9)	4.4	14	.01	.93	+.03
Positive Affect[&] (range 0-8)		4.4	(2.0)	4.3	17	2.7	(1.1)	2.8	14	4.9	.04	-.75
Exploration[&] (range 0-12)		1.3	(.5)	1.3	17	1.8	(.8)	1.8	14	4.34	.05	+.94
												$\bar{x}$ ES = +.13

[^] Effect size (ES) is defined here as the difference between the groups (high minus low) on the $\bar{x}$ scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[*] Statistical analysis for BDI scores was based on raw score data.

[+] Analyses for the Early Intervention Developmental Profile are based on raw scores for the number of correct responses.

[&] Scores are based on a 9-point range with 1 as the most basic level and 9 the most advanced; therefore, high scores are best.

[@] Scores are based on the "ideal" score reported in the manual. A score of "0" is best, and positive ESs indicate that the high intensity intervention group scored better.

[$] Covariates: 1 = BDI Gross Motor Raw; 2 = Family Resource Scale Raw; 3 = Chronological Age at Pretest participation with the examiner), attention span (degree of persistence in attending to object, person, or activity), responsiveness to caretaker (degree of contact through eye contact, vocalizations, and/or touch), and negative affect (crying, avoidance, clinging) revealed no significant differences between groups. The high intensity group scored significantly better ($p \leq .05$) in the areas of exploration of objects using the senses (i.e., tactile via hands and mouth, olfactory) and reactivity (the ease with which the child is stimulated). The score for positive affect (laughing/smiling) was statistically significant ($p = .04$) in favor of the low intensity group. The mean effect size for the CRIB subscales was +.13.

Subgroup analysis. A subgroup analysis was performed on Posttest #1 data applying a two-way analysis of variance by intervention group and by severity of vision loss (acuity worse than 20/800 versus acuity better than 20/800), using Battelle raw scores as dependent variables. No statistically significant interactions were found between intervention and degree of vision loss. However, as would be expected, Battelle scores were influenced by degree of vision loss alone, with children whose acuity was worse than 20/800 receiving lower scores.

The effects of socioeconomic status on degree of child progress was also analyzed, applying a two-way analysis of variance by intervention and by income [income greater than $13,000 (the median income) versus income less than $13,000]. Results reflect a trend toward the high intensity group having a greater impact on BDI scores for families with incomes more than $13,000 compared to families of income less than $13,000; however, only one of the five domains (adaptive) reached a level of significance ($p \leq .03$).

Results of Posttest #2. As of August 1, 1991, 27 of the 29 subjects have completed Year 2 posttesting. As mentioned in the treatment verification section, the degree of intervention has varied for subjects between Year 1 and Year 2 posttesting. Of the 12 subjects assigned to the high intensity intervention, 6 subjects continued to receive the prescribed intervention and 6 graduated from the program upon reaching 3 years of age. Of the 15 children assigned to the low intensity intervention, 8 continued to participate in the original assigned intervention, although their attendance at the group meetings was negligible. Seven children graduated from the program upon reaching three years of age. A summary of the educational services obtained for those children over 3 years of age is presented in Table 1.13. As portrayed in the table, both groups have been receiving a wide range of services. However, this appears to be balanced across groups.

Table 1.13

Summary of Follow-up Programming at Posttest #2 for Subjects Who Graduated from Original Assigned Intervention in the New Orleans VI Study

	Low Intensity (n = 15)	High Intensity (n = 12)
No Educational Services	5	7
Regular Preschool/No Special Services	4	3
Integrated Special Education Services	3	4
Self-Contained Special Education Services	2	1
Other	3	1

Given the various types of interventions present within the low and high intensity intervention groups due to the exiting of subjects from the original intervention upon reaching age 3 years, it is difficult to draw a conclusion regarding two years of consistent intervention. Rather, the data in Table 1.14 reflect the long-term effects of one year of the prescribed interventions.

Battelle pretest gross motor raw scores, the child's chronological age at pretest, and FRS pretest scores were again used as covariates. In reviewing the BDI domain scores for Posttest #2, the mean domain and total scores were not significantly different, reflecting overall negligible effect sizes. The mean scores for Personal/Social and Adaptive Behaviors neared statistical significance (p = .17

Table 1.14

Posttest #2 Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates[&]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES[^]
• **Average time between Pretest and Posttest #2**		26.6	(3.1)		15	26.8	(5.0)		12		.89	
• **Age in months at posttest**		42.1	(9.3)		15	41.5	(14.0)		12		.93	
• **Battelle Developmental[*] Inventory F (BDI)**												
Personal/Social	1,2	115.0	(32.3)	102.2	15	108.3	(29.6)	121.1	12	1.21	.17	.59
Adaptive Behavior	1,2	72.7	(19.2)	63.6	15	66.6	(17.2)	75.7	12	2.60	.12	.63
Fine Motor	1,2	37.9	(12.3)	34.5	15	34.3	(10.6)	37.6	12	.44	.51	.25
Gross Motor	1,2	59.2	(9.1)	54.5	15	48.3	(11.3)	53.0	12	.11	.74	-.16
Communication	1,2	62.4	(19.6)	55.2	15	55.6	(24.2)	62.8	12	.83	.37	.39
Cognitive	1,2	47.2	(23.6)	41.3	15	40.3	(22.8)	46.3	12	.29	.60	.21
TOTAL	1,2	394.4	(107.6)	351.3	15	353.3	(105.4)	396.4	12	1.23	.28	.42
• **Exploration/Play Developmental Age (In Months)**	1,2,3	18.5	(4.5)	16.6	13	14.3	(6.3)	16.3	11	.01	.90	-.07
												$\bar{x}$ ES = +.29

[^] Effect size (ES) is defined here as the difference between the groups (High minus low) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[*] Statistical analysis for BDI scores were conducted using raw scores.

[&] Covariates: 1 = Family Resource Scale; 2 = BDI Gross Motor Raw; 3 = Chronological Age at Pretest

and .12, respectively) in favor of the high intensity group. Positive effect sizes for these two domains were also quite substantial.

The developmental play ages of children based on the videotapes of spontaneous, independent play are reported in Table 1.14. Adjusted mean scores for the two groups revealed no significant differences, with a negligible effect size.

Subgroup analysis. As previously mentioned, subjects were enrolled in the study provided that they were under 30 months of age. Therefore, children who were enrolled as infants received two years of either the low or high intensity intervention. Children who were between two and three years of age at enrollment received one year of the assigned intervention and then graduated from the program. To determine whether duration of intervention was related to outcomes, a subgroup analysis was performed by dividing the high and low intensity groups into those who received two years of the designed intervention and those who received only one year of the intervention. These results are presented in Table 1.15. The subgroup analysis resulted in no statistically significant interaction effect between duration of intervention and intensity on BDI scores. Those who received two years of high intensity intervention did not score significantly better than those who participated in the low intensity intervention for two years. Aside from the interaction effects which were investigated, there appears to be a tendency for younger children, regardless of group assignment, to score better on the BDI than children enrolled at an older age.

Table 1.15

Age at Enrollment Comparison of Child Outcome Measures Collected at Posttest #2 for the New Orleans V.I. Intensity Study

Variable		Low Intensity			High Intensity			Group p Value	Age Status p Value	Groups by Age p Value
		Adj.$\bar{X}$	(SD)	n	Adj.$\bar{X}$	(SD)	n			
CA at Pretest	Younger	7.1	(4.7)	7	4.9	(2.2)	7			
	Older	22.9	(7.3)	8	28.6	(6.1)	5			
● Battelle Developmental Inventory (BDI)										
Personal/Social	Younger	129.2	(27.6)	7	140.3	(25.5)	7	.69	.04	.58
	Older	89.9	(36.3)	8	82.2	(34.8)	5			
Adaptive	Younger	74.2	(17.2)	7	82.0	(13.1)	7	.48	.20	.72
	Older	59.9	(20.6)	8	63.2	(22.4)	5			
Gross Motor	Younger	56.0	(4.3)	7	55.1	(11.8)	7	.54	.62	.60
	Older	54.2	(11.3)	8	49.1	(11.8)	5			
Fine Motor	Younger	39.4	(3.6)	7	44.6	(6.0)	7	.98	.14	.17
	Older	33.1	(14.6)	8	27.6	(14.8)	5			
Communication	Younger	60.3	(15.7)	7	64.3	(13.3)	7	.62	.73	.94
	Older	54.5	(18.9)	8	59.7	(30.3)	5			
Cognitive	Younger	56.4	(8.4)	7	60.1	(8.1)	7	.71	.08	.35
	Older	35.8	(29.1)	8	25.1	(31.5)	5			
Total	Younger	415.4	(72.2)	7	446.5	(67.2)	7	.83	.11	.51
	Older	327.3	(122.4)	8	313.8	(139.0)	5			

Covariates included chronological age at pretest and BDI gross motor raw score.

Results of posttest #3. Table 1.16 summarizes the Battelle Developmental Inventory and Vineland Adaptive Behavior Scales scores for Posttest #3 based on subjects tested as of August 1, 1991. Again, no statistically significant differences were found between low versus high intensity groups. Effect sizes generally were negative, with a mean effect size of -.14. Complete data needs to be obtained on all subjects before these results can be considered as final. Parent-child interaction data will also be analyzed in the future.

Table 1.16

Posttest #3 Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES^
● **Average time between Pretest and Posttest #3**		40.6	(3.0)		11	40.8	(2.5)		9		.91	
● **Age in months at Posttest #3**		57.3	(10.2)		11	57.1	(14.1)		9		.98	
● **Battelle Developmental Inventory (BDI)**												
Personal/Social	1,2	142.8	(23.1)	137.5	11	121.8	(33.7)	127.0	9	.54	.47	-.45
Adaptive Behavior	1,2	87.4	(14.6)	81.2	11	80.4	(18.6)	86.6	9	.58	.46	.37
Fine Motor	1,2	50.5	(13.1)	46.3	11	34.1	(12.8)	38.4	9	2.13	.16	-.60
Gross Motor	1,2	67.4	(9.2)	62.3	11	55.0	(14.9)	60.1	9	.19	.67	-.24
Communication	1,2	81.8	(23.8)	76.5	11	64.0	(28.0)	69.3	9	.54	.47	-.30
Cognitive	1,2	72.2	(26.6)	67.0	11	56.3	(24.7)	61.5	9	.45	.51	-.21
TOTAL	1,2	502.2	(102.9)	469.5	11	410.3	(119.9)	443.0	9	.38	.55	-.26
● **Vineland Adaptive Behavior Scale (Standard Score)**												
Communication	1,2	101.0	(14.2)	93.3	11	85.5	(31.5)	90.2	10		.66	-.21
Daily Living	1,2	93.6	(17.2)	84.1	11	81.5	(33.2)	88.9	10		.86	.27
Socialization	1,2	99.7	(11.2)	95.6	11	88.2	(21.1)	92.3	10		.73	-.29
Motor Skills	1,2	83.9	(20.2)	76.1	11	69.2	(15.4)	77.0	10		.93	.04
											$\bar{x}$ ES =	-.14

♦ 1 = BDI gross motor raw, 2 = Chronological age at pretest.

^ Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Data are reported for one year and two years following enrollment. Previously-described procedures were again implemented in the selection of covariates.

Posttest #1. Table 1.17 represents results of analysis involving family functioning measures. One family declined to complete the measures, therefore data from the high intensity group included 13 rather than 14 subjects. Analysis of covariance was performed using pretest scores for BDI gross motor raw score and Family Resource Scale. No significant differences were found between groups on any of the family measures. In reviewing effect sizes based on the measures of stress, small but positive effect sizes resulted for the total score of the PSI child subdomain and total score, while negative effect sizes resulted for the FRS, FSS, and FACES III scores. However, these negative effect sizes were also negligible. The mean effect size for all family measures at Posttest #1 was -.06.

Table 1.17

Posttest #1 Measures of Family Functioning for Alternative Intervention Groups for NO/VI Intensity

		Low Intensity Group					High Intensity Group							
Variable	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj $\bar{x}$	%ile	n	ANCOVA F	p Value	ES^
● Average Length of Intervention		12.7	(2.0)			17	12.3	(.5)			14		.46	-.20
● **Parent Stress Index**#@ **(PSI)**														
Child Related Range (50 to 235)	1,2	107.2	(15.5)	109.7	75	17	109.5	(21.4)	107.0	70	13	.12	.73	+.17
Parent Range (47 to 270)	1,2	124.3	(24.2)	123.6	56	17	123.5	(20.9)	124.2	56	13	.00	.96	-.02
Total Range (101 to 505)	1,2	231.5	(30.7)	233.4	65	17	233.1	(38.7)	231.2	63	13	.02	.88	+.07
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**														
Adaptability	1,2	23.6	(10.0)	24.5		16	23.0	(3.8)	22.0		13	.57	.46	-.04
Cohesion	1,2	40.1	(10.2)	38.9		16	38.1	(19.1)	39.3		13	.03	.86	-.20
● **Family Resource Scale (FRS)**&%	1,2	129.6	(10.8)	123.3	59	17	113.4	(20.0)	119.7	50	13	.45	.45	-.33
● **Family Support Scale (FSS)**&%	1,2	35.6	(9.4)	34.2	71	16	29.7	(8.4)	31.1	63	13	.69	.41	-.33
● **Family Support Scale # of Sources**	1,2	15.9	(3.1)	16.1		16	16.8	(2.4)	16.7		13	.24	.63	+.19
													$\bar{x}$ ES =	-.06

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^ Effect size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a general discussion of the concept of effect size).

♦ Covariates: 1 = BDI Gross Motor Raw Score; 2 = Family Resource Scale Raw Score

$ A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

Statistical analysis and effect size (ES) estimates for PSI was d on raw scores where low raw scores and positive ES are most desirable.

@ A low raw score and/or a low percentile score indicates lower stress level.

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

% No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with children with disabilities).

Analysis of parent-child interaction videotapes. The Multi-pass scheme (Marfo, 1989) was implemented for the coding of the parent-child interaction tapes. Multi-pass was designed primarily to study the notion of maternal directiveness in relation to the responses of parent and child to one another. The behavior count section of Multi-pass uses an event-based coding system targeting four types of parental directive behavior: 1) turn taking control, 2) response control, 3) topic control, and 4) inhibitive/intrusive control. The system also allows for a close analysis of verbal directiveness. Videotapes were sent directly to the author of Multi-pass to ensure accurate coding. Analysis of the raw data was conducted by the EIEI site coordinator. Multi-pass provides data on 40 specific behaviors; therefore, related variables were combined to reflect the four dimensions of parental directive behavior. Additionally, dimensions of child responsiveness were also developed by combining related behaviors.

Table 1.18 reports the results of preliminary Multi-pass scoring comparing the low versus high intensity groups. To date, 14 of the 31 Posttest #1 videotapes have been coded. Due to this small number of subjects, only t-tests are reported rather than analysis of covariance. Results show that the groups did not differ significantly in regard to turn taking control of parent (degree of balance in participation between parent and child), response control parent (extent to which parent behavior is directed at attempting to get the child to respond), response control of child (extent to which child behavior is directed at attempting to get the parent to respond), frequency of parent imperative, embedded, implied directives, frequency of child's compliance with these directives, frequency of parent instructional behaviors (labels, expands, gives and requests information, models, and reinforces). There was a statistically significant difference between groups on the frequency of parental inhibitions and intrusions (verbal or nonverbal behavior directed at stopping the child from engaging in an activity or behavior that is not considered to be dangerous/undesirable, or imposing the parental agenda at the cost of the child's interests) in favor of the high intensity group ($p \leq .05$). However, it should be noted that this was a very low frequency variable. Associated with the frequency of parental inhibiting behaviors is the frequency of child's compliance with parental inhibitions. Mean scores for compliance in the high intensity group were lower (though not significantly so), most likely due to the lower number of parental inhibitions which were directed toward them.

Table 1.18

Year #1 Posttest Measures of Parent-Child Interaction for Alternative Intervention Groups for NO/VI Intensity Study

		Low Intensity				High Intensity						
	Covariates[&]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES[^]
MULTI-PASS[*]												
● **Parent Behavior**												
Turn-Taking Control[+]		1.64	(.4)		7	1.67	(.4)		7		.86	-.08
Response Control[+]		5.58	(1.9)		7	4.35	(1.6)		7		.21	+.65
Inhibitions/Intrusions[+]		.52	(.2)		7	.25	(.1)		7		.00	+1.35
Imperatives/Implied[+]		2.90	(1.1)		7	2.71	(2.7)		7		.68	+.17
Instructional Behaviors		4.43	(2.3)		7	3.82	(1.0)		7		.56	-.27
● **Child**												
Response Control[+]		.59	(.5)		7	.27	(.2)		7		.18	+.64
Compliance with Inhibitions		.32	(.2)		7	.17	(.1)		7		.13	+.75
Compliance with Directions		1.88	(.8)		7	1.46	(.8)		7		.33	-.53
											$\bar{x}$ ES =	+.35
PARENT/CAREGIVER INVOLVEMENT SCALE												
● **Average Rating**												
Amount	1,2	2.9	(.7)	2.8	17	2.9	(.4)	3.0	12	.37	.48	.29
Quality	1,2	3.6	(.7)	3.5	17	3.7	(.5)	3.8	12	.94	.38	+.43
Appropriateness	1,2	3.8	(.8)	3.6	17	3.7	(.7)	3.8	12	.18	.67	+.25
● **General Impression**												
Availability	1,2	4.0	(.9)	4.0	17	3.9	(.8)	3.9	12	.06	.81	-.11
Acceptance	1,2	3.7	(1.0)	3.8	17	3.9	(.8)	3.9	12	.06	.82	+.10
Atmosphere	1,2	3.5	(.9)	3.4	17	3.8	(.8)	3.8	12	1.20	.29	+.44
Enjoyment	1,2	3.4	(.9)	3.4	17	3.5	(.7)	3.5	12	.21	.65	+.11
Learning Environment	1,2	3.3	(1.2)	3.1	17	3.3	(1.0)	3.4	12	.39	.54	+.25
Mean General Impression	1,2	3.6	(.9)	3.5	17	3.7	(.7)	3.7	12	.26	.61	+.22
											$\bar{x}$ ES =	+.21
PARENTAL BEHAVIOR RATING SCALE												
● Affective relationship with child	1,2	3.1	(.6)	3.0	15	3.1	(.6)	3.2	12	.52	.48	.33
● Orientation/responsivity to child	1,2	3.1	(.8)	3.0	15	3.1	(.7)	3.2	12	.50	.49	.25
● Performance orientation	1,2	3.2	(.7)	3.1	15	3.2	(.6)	3.2	12	.48	.50	.14
											$\bar{x}$ ES =	+.24

[^] Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

[*] All scores reflect frequency of occurrences divided by number of minutes recorded.

[+] Higher scores associated with higher level of directiveness.

[&] Covariates: 1 = BDI gross motor raw score at pretest; 2 = FRS total; 3 = chronological age, pretest.

Posttest #1 parent-child interaction tapes were also analyzed using the Parent/Caregiver Involvement Rating Scale (Farran et al., 1986). This scale is designed to assess the behavior of the caregivers (in this case, mothers) during play interactions. Behavior is rated in regard to the amount displayed, the quality, and the appropriateness of 11 behaviors: physical involvement, verbal involvement, responsiveness, play interaction, teaching behavior, control activities, directives given, relationship among activities, positive statements, negative statements, and goal setting. The tapes were rated by coders trained by Farran, who demonstrated strong adherence to standard procedures. The average rating scores reported reflect averages of the 11 behaviors. Amount was scored based on a 5-point Likert-type scale with a "3" being the most desirable score. An analysis of covariance were conducted for all the ratings using the BDI gross motor raw score, the FRS total score, and the child's chronological age at pretest. As shown in Table 1.18, both groups received almost ideal scores in regard to amount of behaviors, with no difference between the groups. Quality and appropriateness were scored based on a 5-point Likert-type scale, with "1" being worst and "5" being best. There were no statistically significant differences between the groups in regard to quality or appropriateness of these behaviors, with both groups receiving higher than average scores in regard to these two factors.

The coders using the Parent/Caregiver Involvement Scale also rated his/her general impressions of the caregiver depicted in the videotape. This included availability of the parent to the child, acceptance of the child, general atmosphere of the interaction, amount of enjoyment between parent and child, and parent's provision of a learning environment. These characteristics are also scored using a 5-point Likert-type scale, with "1" being poor and "5" being best. Scores for both groups were in the moderate range, with no significant differences between groups. Finally, a mean general impression score was calculated, revealing a minimal effect size in favor of the high intensity group. The mean effect size for the Parent/Caregiver Involvement Scale was .21 ("amount" not included).

Finally, the results of the Parental Behavior Rating Scale are presented in Table 1.18. The tapes were scored by Mahoney, the developer of the rating system.

No significant differences were found between groups in regard to the parent's affective relationship with the child, the parent's affective relationship with the child, the parent's orientation/responsivity to the child, or the parent's orientation toward the child. The group as a whole received mean scores of "3," connoting an average appropriate amount of the measured characteristics. The average effect size for the Parental Behavior Rating scale was .24.

Posttest #2. The core family measures were again administered two years from date of pretest. The parents of one subject again refused to complete the family measures, therefore data on only 11 of the 12 subjects from the high intensity intervention were available for analysis. As depicted in Table 1.19, no statistically significant differences were found between intervention groups on most of the family measures. However, the difference in the FACES III measure of cohesion neared significance, in favor of the high intensity group. The average effect size for all the family functioning measures at Posttest #2 was -.02. Percentile rank scores for the PSI, FRS, and FSS are also reported in the table. These scores reflect average levels of stress, resources, and supports for the families is a whole.

Subgroup analysis. The interaction of duration with intensity was also analyzed using family measures data collected at Posttest #2. As shown in Table 1.20, there were no differences found as a result of duration of early intervention. There also was no interaction effect due to the age of the children.

Posttest #3. Results of family outcome data for a portion of the study sample is reported in Table 2.21. Using an analysis of covariance, no statistically significant differences were found between groups at the .05 level or greater. The total resources score on the FRS and the cohesion subscale of the FACES III neared significance, in favor of the high intensity group. High positive effect sizes were also noted for these two variables. However, negative effect sizes were found in relation to the Family Support Scale (total and number of supports) as well as PSI

Table 1.19

Year 2 Posttest Measures of Family Functioning for Alternative Intervention Groups for N.O./VI Intensity Study

		Low Intensity Group					High Intensity Group							
Variable	Covariate[δ]	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	p Value	ES[^]
Average time between pretest and posttest		26.6	(3.1)			15	26.8	(5.0)			12		.93	
Parent Stress Index (PSI)[#@]														
Child Related (Range 50 to 250)	1,2	102.4	(12.6)	105.0	65	15	112.0	(19.6)	109.4	74	11	.33	.57	-.35
Parent (Range 54 to 270)	1,2	120.0	(16.4)	123.3	55	15	127.5	(21.0)	124.2	56	11	.01	.92	-.05
Total (Range 101 to 505)	1,2	223.1	(24.5)	229.3	61	15	239.8	(36.6)	233.6	66	11	.10	.76	-.18
Family Adaptation and Cohesion Evaluation Scales (FACES)														
Adaptability	1,2	21.9	(4.9)	22.3		15	19.9	(4.6)	19.6		11	1.31	.27	-.55
Cohesion	1,2	38.8	(5.1)	36.6		15	38.4	(7.4)	40.6		11	2.60	.12	.78
Family Resource Scale (FRS)[&%]	1,2	132.7	(13.5)	126.2	65	15	120.0	(20.8)	126.5	67	11	.00	.96	.02
Family Support Scale Total (FSS)[&%]	1,2	30.1	(9.3)	27.3	48	15	28.6	(11.6)	31.7	67	11	1.02	.32	.47
FSS Sources[%]	1,2	14.8	(2.6)	15.4		15	15.4	(2.7)	14.7		11	.35	.56	-.27
													$\bar{x}$ ES =	-.02

[δ] Covariates: 1 = BDI gross motor raw, 2 = Family Resource Scale.

[#] Statistical analysis and Effect Size (ES) estimates for PSI was based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[^] A low raw score and/or a high percentile score indicates lower stress level, and a positive ES is more desireable.

Table 1.20

Age at Enrollment Comparison of Child Outcome Measures Collected at Posttest #2 for the New Orleans V.I. Intensity Study

Variable		Adj.$\bar{x}$	(SD)	n	Adj.$\bar{x}$	(SD)	n	Group p Value	Age Status p Value	Groups by Age p Value
PSI Total	Younger	231.8	(27.4)	n	233.4	(44.0)	7	.55	.86	.61
	Older	20832	(16.3)	8	235.8	(13.9)	4			
FSS Total	Younger	36.3	(6.4)	7	34.2	(11.2)	7	.94	.21	.54
	Older	24.2	(11.6)	8	27.0	(6.5)	4			
FRS Total	Younger	119.9	(16.9)	7	120.6	(21.7)	7	.98	.24	.89
	Older	135.3	(8.3)	8	134.2	(13.9)	4			
FACES Cohesion	Younger	36.0	(5.0)	7	42.0	(8.8)	7	.13	.91	.42
	Older	37.5	(5.4)	8	39.6	(4.3)	4			
FACES Adaptability	Younger	24.3	(6.6)	7	20.2	(5.7)	7	.21	.57	.68
	Older	20.9	(3.3)	8	18.7	(1.9)	4			

Covariates included chronological age at pretest and BDI gross motor raw score.

Table 1.21

Posttest #3 Measures of Family Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity Group					High Intensity Group							
Variable	Covariate$^{\delta}$	$\bar{x}$	(SD)	Adj.x	%ile	n	$\bar{x}$	(SD)	Adj.x	%ile	n	ANCOVA F	p Value	ES^
● **Average length of intervention**														
● **Parent Stress Index$^{\#@}$ (PSI)**														
Child Related Range (50 to 235)	1,2	106.5	(12.5)	108.2	71	111	107.4	(23.4)	105.7	67	8	.05	.83	.20
Parent Range (47 to 270)	1,2	118.8	(16.1)	121.4	50	11	130.1	(22.9)	127.5	63	8	.25	.62	-.38
Total Range (101 to 505)	1,2	225.4	(26.5)	229.6	62	11	237.5	(43.5)	233.3	65	8	.03	.87	-.14
● **Family Adaptation and Cohesion Evaluation Scale (FACES)**														
Adaptability	1,2	21.8	(4.5)	22.8		11	24.8	(7.1)	23.8		8	.07	.80	.22
Cohesion	1,2	37.7	(2.8)	36.7		11	40.1	(6.2)	41.1		8	2.59	.13	1.57
● **Family Resource Scale$^{\&\%}$ (FRS)**	1,2	130.7	(14.8)	122.3	57	11	124.3	(18.6)	132.7	77	8	1.85	.20	.70
● **Family Support Scale$^{\&\%}$ (FSS)**	1,2	30.8	(9.3)	33.7	71	11	30.5	(12.1)	27.6	51	8	.81	.38	-.66
● **Family Support Scale$^{\&\%}$ # of Sources**	1,2	16.5	(3.7)	17.1		11	14.3	(4.0)	13.7		8	2.00	.18	-.92
													$\bar{x}$ ES =	+.07

$^{\delta}$ 1 = BDI gross motor raw score at pretest, 2 = FRS raw score at pretest.

$^{@}$ A low raw score and/or a low percentile score indicates lower stress level.

$^{\&}$ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

$^{\%}$ No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

^ Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

total and the parent-related stress subdomain. The average effect size for all the family measures was .07. Again, Posttest #3 data has not yet been obtained on all subjects and, therefore, these results are not conclusive.

Conclusions

Based on the results of data collected after 12 months of intervention, it appears that there are negligible effects due to the high intensity intervention on measures of child and family functioning. Although not statistically significant, small positive effect sizes resulted for the Battelle Developmental Inventory (on all but the gross motor domain) at Posttest #1, and moderate effect sizes resulted for Posttest #2 (except for gross motor). This positive trend was contradicted by the Early Intervention Developmental Profile at Posttest #1 and the Exploratory/Play Assessment at Posttest #2, for which negative effect sizes resulted. One significant difference did appear at Posttest #1 when assessing behaviors that are less developmentally-based (i.e., the CRIB); specifically, the high intensity group scored significantly better in regard to exploring with other senses, a skill that is important for children with visual impairments.

Based on all of the data collected, there appear to be no general effects on family functioning due to more intensive early intervention. Although one or two variables tend to favor the high intensity groups at one of the posttests, there is no consistent pattern which would support findings in favor of one group or the other. In general, the families in this study appeared to have higher stress than families of children without disabilities. However, the intensity of the intervention received does not appear to have influenced that level of stress.

The investigation of the interventions impacting parent-child interaction was thoroughly conducted via three well-respected coding systems. Although only Posttest #1 data have been scored at this point, the findings conclude that there were no differences due to intensity of intervention. The future analysis of parent-child interaction data is still valuable from the stand point of providing insight into parents and children with a visual disability. To date, such an extensive data set has not been collected.

Although the results of this study are only based on 31 children immediately following one year of intervention (a relatively small number of children for intervention studies such as this), it is important to note that most of the previous experimental studies of the effects of early intervention with children with visual impairments were based on even smaller numbers. The findings of this study are substantially different than those from previous studies; therefore, it is important to reiterate the reasons why discrepancies may have occurred.

First, this study was based on a randomized experiment; few of the previously mentioned studies involved a control group for comparison. Furthermore, this study used diagnosticians who were uninformed as to subject assignment to assess child outcome variables, and efforts were also undertaken to ensure that the expected treatments were delivered as planned. Therefore, the difference in results between this study and previous research may be attributable to the quality of the research design.

Second, questions might be raised about the fact that intervenors were not certified in visual impairment. Although the intervenors were supervised by someone with a Ph.D. in visual impairment, the direct intervenors were not certified to serve the visually impaired. One might argue that children with visual impairments are so unique that it is necessary for intervention to be delivered by a person certified in visual impairment. However, as postulated by the study's independent reviewer, the mere presence of visually impaired, certified instructors does not guarantee quality early intervention services (Ferrell, 1990). The vast majority of certified VI personnel have received training focusing on school-age children and/or adults. The use of such certified instructors who lack the early childhood and family-focused training may be equally inappropriate. Currently, there are only a few personnel development programs in the United States which provide an emphasis in early intervention for children with visual impairments. The shortage of personnel with expertise in both early childhood visual impairment is even greater than the scarcity of teachers certified to serve the visually impaired. Therefore, the high intensity intervention provided by this study, although perhaps not ideal, is not uncharacteristic of typical early intervention for children with visual impairments.

Studies comparing treatment provided by intervenors certified to serve infants and toddlers who are visually impaired versus the generic early childhood/special educator would speak to this specialized training issue.

Based on the results of this study, it appears that the weekly home visit intervention was not cost-effective. Given the total cost of nearly $7,000 per child in agency resources, and the lack of general observable benefits for either families or children, one must consider if this funding may be spent more effectively in other ways. Perhaps funding should be used to support the use of visual impairment experts as consultants with families (perhaps contact on a monthly basis). Although this study raises such questions, replication is necessary before they can be definitively answered.

Third, it may be that children who are visually impaired, even at this young age, need much more comprehensive intervention services. Perhaps to achieve substantial benefit, it is necessary to have intervention programs which deliver professionally mediated intervention on a daily basis to the children. This would mean the possibility of needing greater funding to be contributed to early intervention services.

A fourth possibility is that perhaps the focus of the intervention should change to provide primary support and assistance to the family rather than emphasize developmental therapy directed toward the child. Although the high intensity intervention in this study was consistent with what is delivered in most early intervention programs, it is possible that different findings may result through the application of completely different forms of interventions. Although Individualized Family Service Plans (IFSPs) were implemented, the intervention was primarily child-focused. Perhaps a more radical orientation to the strengths and needs of the family should receive the primary emphasis, with minimal direct child contact. More intervention focused on parenting skills and coping behaviors may meet the immediate needs of parents with infants and toddlers. It is worth reiterating that the parents in the high intensity group did not have the benefit of participating in a parent support group; such contacts may be critical to parents of children with a specific disability.

In regard to long-term effects, there do not appear to be any significant differences between the groups as measured by the aforementioned instruments. However, it would be premature to conclude that neither of the interventions had an impact on later child and/or family functioning since not all children have completed Posttest #2 or #3. As other studies have shown, effects of intervention often are not evident until longitudinal data have been collected (Infant Health and Development Program, 1990). It may be that families with young children during the first three years initially benefit from less intense general support and access to resources, and that the individualized developmental intervention shows it effects in later stages (i.e., the early school years). These are issues which will require extended research.

SMA/LAKE McHENRY PROJECT

Project #2

COMPARISON: Children with Severe Disabilities--Once per week versus three times per week services.

LOCAL CONTACT PERSON: Dr. Alice Kusmierek, Coordinator, Interagency Project for Early Intervention.

EIRI COORDINATORS: Matthew J. Taylor, Utah State University; Stacey E. McLinden, Ph.D., Assistant Professor, University of Wisconsin--Milwaukee

LOCATION: Flossmoor, Illinois (Chicago Suburb)

DATE OF REPORT: 11-12-1991

Rationale for Study

Although popular support for early intervention efforts has been strong, research on early intervention effectiveness has shed little light on important issues such as the relative effectiveness of various program intensities (White & Casto, 1985). The research base which has dealt with moderate to severe young children with disabilities is particularly sparse. It is only within the last 15 years, since the advent of P.L. 94-142, that children with significant impairments have been systematically included in early intervention programs (Bailey & Bricker, 1984). Thus, little is known about the optimal intensity of services to be provided to this group of children.

The implementation of P.L. 99-457 has focused attention on early intervention services in general and on services to infants and toddlers in particular. As states are developing plans to provide service to the youngest population of children with disabilities, questions are being raised regarding the most appropriate types of services to be provided. Peterson (1987) has discussed seven specific decisions which must be made regarding the development of a service delivery program, including who will be the target of service (e.g., child, mother, father, both parents, family), at what age services should begin, what services should be provided, in what setting the intervention program will be provided, who will be the primary intervention agent, in what social context services will be provided (e.g. individual or group program), and which agencies will provide services.

Although certain aspects of service delivery will be determined by practical and political forces (i.e., decisions regarding the agencies through which services will be delivered will be made at a state level based on the ability of different state agencies to perform this role) decisions regarding other aspects of service delivery can be facilitated by the availability of research data on the effectiveness of various approaches. Such data are particularly important in light of the cost issues (i.e., the cost of human as well as monetary resources) which various approaches to service delivery entail. However, the overriding issue should be, and is, how the services which are provided to infants and toddlers and their families can maximize their development. Decisions regarding the type of services to be provided are particularly important, as such decisions are directly related to both the cost of intervention as well as its effectiveness. Although a myriad of research questions on the relative costs and effects of different types of services can be asked, a very basic question is, "How many hours of service should be provided each week to maximize child and family functioning?"

According to Bricker (1986), one hour per week of individual services is a common service delivery model for children under age three, in either a home-based or center-based setting with the child and primary caregiver present. This model has face validity from both a cost and a practical perspective (i.e. it makes sense to provide a relatively low intensity of services to young children whose skill development needs are relatively restricted as a result of their age, as well as to recognize the parent's responsibility as a caretaker first and an intervention agent second). However, given the impetus of increased funding for infant and toddler services, the question of efficacy must be raised with regard to the appropriateness of such a relatively low intensity of service. A very important question is whether an increase in the frequency with which services are provided would result in greater gains in both child and family functioning?

Overview of Study

The purpose of this study was to address the question of the relative efficacy of different intensities of early intervention services for children with disabilities under age three. The study involved an experimental comparison of the costs and effects of serving children on either a one-hour-per-week or a three-hour-per-week basis. Three hours per week were selected as the greater level of intensity of services based on a number of factors. First, even a more intensive level of service must take into account the factors of child skill development needs as well as the parent's role in intervention. While 20 hours of individual services per week provides a very clear cut intensity comparison, it not only dramatically increases the parent's role as an intervention agent, but may be difficult to justify given the types of skills and rate of skill development expected of any child under age three. Costs of providing such services on an individual basis would also be extremely high. One hour three times per week, however, represents a level of service which is more intense than once per week, yet is not so intense that the parent's role is changed or expectations for child gains are exceeded. It was hypothesized that three times per week services would not only maximize the opportunity to intervene with particular child skills, but would increase the opportunity for program staff to provide family-oriented services as specified by P.L. 99-457.

To examine relative effectiveness of once-per-week vs. three-times-per-week services, a number of measures of child and family functioning were selected for this study. Some measures have been administered at pretest, one year, two years, three years, and again at four years following the child's enrollment in the study. Other measures were administered at the first or second posttest only. To assess intervention effects on the child, the Battelle Developmental Inventory (BDI) (Newborg et al., 1984) Bayley Scales of Infant Development (Bayley, 1969), Wisconsin Behavior Rating Scale (Song & Jones, 1980), and Scales of Independent Behavior (Bruininks, Woodcock, Weatherman, & Hill, 1984) were administered.

The BDI, which was administered at pretest and during each posttest year, was selected to assess the child's overall development as well as skill development in five domains of functioning: Personal/Social, Adaptive, Motor, Communication, and Cognitive. The BDI allows for direct assessment and observation of child skills as well as use of parental report. The scale was developed for use with children birth to 8 years of age, thus facilitating the assessment of children of different ages on a longitudinal basis. The Bayley Scales, which were administered at the one year posttest, were selected to provide a more fine-grained analysis of the child's cognitive and motor skills. The Bayley has also been used extensively in previous studies of early intervention; thus, their use would facilitate comparison of the results of this study to other work. The Wisconsin Behavior Rating Scale, administered at pretest and at one year posttest, is completed by a specialist or educator who is familiar with the child, and thus allows for another source of data to be used to assess child skill development. The Early Development Scale (ED) and Short Form (SF) of the Scales of Independent Behavior (SIB) were administered at Year 2 posttest to provide additional data on the extent to which interventions impacted the subjects' adaptive behavior. The SIB ED and SF were administered because there is evidence to suggest that age scores obtained on these scales may be significantly different for this population (Goldstein, Smith, Waldrup, & Inderbitten, 1987).

A battery of instruments which would allow for the assessment of the effects of intervention on the mothers and fathers of subjects was also administered. These instruments were selected to address criticisms of previous research in which the focus of assessment was restricted to child outcome measures (Mott et al., 1986). The instruments selected for use in this study were based on reviews of the literature on expected family outcomes, and variables with the potential to mediate family outcomes, and thus included measures of parent stress, social support, resources, family functioning, and life events and changes. The specific instruments included the Parenting Stress Index (Abidin, 1986), the Family Support Scale (Dunst et al., 1984), the Family Resource Scale (Dunst & Leet, 1985), the Family Adaptability and Cohesion Evaluation Scales (Olson et al., 1985), and the Family Inventory of Life Events and Changes (McCubbin et al., 1983). The Comprehensive Evaluation of Family Functioning Scale (McLinden, 1988), a new scale developed to assess the impact of the child with a disability in the family, was also administered to both the mothers and fathers at Years 2, 3, and 4 posttest.

Methods

Subjects

A total of 72 children who were served by 3 different early intervention programs in the Chicago suburbs were included as subjects. Sixty children were posttested at Year 1, 49 at Year 2, and 38 at Year 3. Thirty-six subjects have been included in Year 4 analysis, and, as the testing cycle for Year 4 was not completed prior to this report, more subjects will be added for next year's report.

Recruitment, assignment to groups, and demographic characteristics of the subjects are described below.

Recruitment. Subjects were recruited from three intervention programs in the Chicago suburbs. The three programs--South Metropolitan Association (SMA), Lake-McHenry Regional Program (LMRP), and Southwest Cooperative Association (SW Coop)--received funding from the State of Illinois Board of Education from July 1, 1985, through June 30, 1988, to investigate the effects on measures of child and family functioning of tripling the intensity of services that were then being provided to the birth to three population. All three programs had in the past provided once-per-week intervention services to children under age three. As a condition of receiving additional funding from the state, each agency agreed to provide three-times-per-week services to a randomly assigned experimental group, while continuing to provide once-per-week services to other children.

Between January 1, 1986, and June 30, 1987, all children who were referred to any of these three programs were considered for inclusion in the study if they were 24 months of age or less and had either a diagnosed disability or demonstrated overall developmental delay of 65% or more. A determination of developmental delay was made through a multidisciplinary team assessment conducted by the program as well as through completion of the Wisconsin Behavior Rating Scale by the member of the team assigned as the child's case manager. The age cutoff was included to ensure that all children would have an opportunity to participate in at least one year of early intervention services before moving on at age three to a preschool program operated by the public school system. Children who met the criteria were informed of the nature of the research project by program staff and asked to participate in the study. The requirement of random assignment to groups, and the possibility of obtaining three-times-per-week services, was emphasized. It was made clear that a decision not to participate in the study would in no way influence their ability to access the once-per-week services typically provided by the program.

Attrition

A total of 72 children and their families agreed to participate and were pretested in the study. Of these, 12 families dropped out of the research project before Year 1 posttest data could be collected, an additional 11 subjects dropped out before completing Year 2 posttest, and 11 additional families did not participate in Year 3 posttesting. Attrition between Year 3 and Year 4 at this time is minimal and includes both the loss of subjects and the recruitment of previously attritted subjects. The most common reason for attrition before Posttest #1 was a move out of the area (6 subjects). Other reasons included death of the subject (2 subjects), refusal to participate in posttesting, or dissatisfaction with the frequency or nature of services provided (4 subjects).

There was an unequal proportion of subjects from the experimental group (8) who dropped after Year 1 posttest versus the control group (3). However, the reasons for attrition were similar across groups. Of the eight experimental group subjects who dropped, five moved and three refused to participate in testing. Of the three control subjects who dropped, two moved and one refused to participate in testing. This attrition did not affect the comparability of the groups on any pretest variable. Attrition between Posttest #2 and Posttest #3 was equal across groups (5 expanded, 6 basic). Of the 11 subjects, 2 died, 1 moved, and 8 refused to participate in testing.

Despite the high attrition in the first three years of the study, the groups remained remarkably comparable for all posttest analyses. In fact, the groups were more comparable for subjects included in Year 4 analysis than for all subjects pretested. Those variables that did show significant differences between groups were either not practically significant (e.g., mothers' ages being three years different), or were in favor of the expanded intervention group (e.g., percent with both parents living at home, and percent with mothers employed as technical/managerial or above). In each of these cases, including ethnicity, the differences were accounted for by covariation when a strong relationship between that variable and any dependent measure appeared. Table 2.1 shows the comparability of the groups on demographic variables for subjects used in each analysis.

Table 2.2 shows the results of a series of 2 x 2 ANOVAs conducted to determine whether there were any statistically significant group by subject status (i.e., subjects who dropped versus those that did not) interactions. With only two exceptions, the Family Resource Scale at Years 3 and 4, and the total Parent Stress Index at Year 4, the groups did not attrit differently at any time. In each of these cases, however, the group comparability after attrition was not compromised (see Table 2.2).

One interesting note from this analysis is that there was a difference between subjects who stayed in the analyses and those that did not. As the years passed, more and more lower income subjects failed to participate in testing. This is indicated by both income and father education variables. These differences do not affect the internal validity of the study, but might add some problems for externalization.

Attrition between Posttest #3 and Posttest #4 is not yet known at this time. Because the testing procedure is an ongoing process for this study, a number of subjects have yet to be tested for Posttest #4. All subjects tested for Posttest #3 have been scheduled for testing.

Assignment to groups. Subjects entered the study on a continuous basis as identified by the programs and were randomly assigned to groups by the EIRI coordinator. Data on the subject's disability and/or developmental status as provided by the program, and parent's level of stress as determined by the parent's

Table 2.1

Comparability of Groups on Demographic Characteristics for SMA/Lake McHenry Project

	All Subjects Pretested								Subjects Included in Year #1 Analyses (Based on Pretest Demographics)							
	Basic Intervention			Expanded Intervention					Basic Intervention			Expanded Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
Age of child in months at program entry	15.1	(6.4)	39	13.3	(6.4)	33	.24	-.28	15.0	(6.2)	31	13.7	(6.4)	29	.42	-.21
Age of mother in years*	29.3	(5.8)	38	31.5	(4.9)	33	.08	|.38|	29.4	(5.3)	31	32.0	(5.1)	29	.06	|.49|
Age of father in years*	31.9	(5.8)	35	33.2	(6.7)	33	.41	|.22|	31.7	(5.5)	28	33.7	(7.0)	29	.25	|.36|
Percent male*	51		39	61		33	.46	|.17|	48		31	62		29	.31	|.26|
Years of education for mother	13.5	(1.9)	38	13.1	(1.6)	33	.30	-.21	13.6	(2.0)	31	13.0	(1.6)	29	.20	-.30
Years of education for father	14.1	(2.1)	35	13.6	(2.1)	33	.38	-.24	14.3	(2.0)	28	13.7	(2.1)	29	.28	-.30
Percent with both parents living at home	71		38	91		33	.05	.46	71		31	93		29	.04	.52
Percent of children who* are Caucasian	82		38	97		33	.07	|.42|	81		31	97		29	.09	|.43|
Hours per week mother* employed	10.6	(16.5)	38	6.9	(14.3)	32	.32	|.22|	9.3	(15.5)	31	7.6	(14.9)	29	.68	|.11|
Hours per week father* employed	36.3	(14.3)	33	40.9	(9.8)	29	.15	|.32|	37.0	(14.0)	26	40.8	(10.4)	26	.27	|.27|
Percent of mothers employed as technical/managerial or above	11		38	25		32	.13	.36	13		31	28		29	.18	.34
Percent of fathers employed as technical/managerial or above	36		33	34		32	.87	-.04	29		26	34		28	.72	.09
Total Household income	$28,100	($21,058)	35	$29,516	($16,948)	32	.76	.07	$30,190	($22,258)	29	$29,982	($17,253)	28	.97	-.01
Percent receiving public** assistance	21		33	23		26	.84	-.05	17		29	23		22	.63	-.13
Percent with mother as primary caregiver	97		33	97		30	.93	-.02	96		27	96		26	.97	-.01
Percent of children in* daycare more than 5 hours per week	10		39	3		33	.34	|.22|	13		24	3		22	.66	|.21|
Number of siblings*	1.1	(1.1)	38	1.2	(1.0)	33	.70	|.09|	.9	(.8)	31	1.2	(1.0)	29	.20	|.38|
Percent with English as primary language	92		38	100		33	.22	.29	90		31	100		29	.19	.33

(continued)

* Effect sizes reflect the magnitude of differences only

** Direction of effect sizes is reversed to reflect the negative relationship to outcomes.

NOTE: Effect sizes from percentages were computed from a *t* statistic after an additional subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

Table 2.1 (continued)
Comparability of Groups on Demographic Characteristics for SMA/Lake McHenry Project

	Subjects Included in Year #2 Analyses (Based on Pretest Demographics)								Subjects Included in Year #3 Analyses (Based on Pretest Demographics)							
	Basic Intervention			Expanded Intervention					Basic Intervention			Expanded Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
Age of child in months at program entry	15.0	(6.4)	28	12.5	(5.6)	21	.16	-.39	15.8	(6.3)	22	12.4	(5.6)	16	.19	-.54
Age of mother in years*	28.9	(5.3)	28	32.2	(5.2)	21	.03	|.62|	29.9	(5.4)	22	31.6	(4.8)	16	.32	|.31|
Age of father in years*	31.2	(5.6)	25	33.2	(5.6)	21	.22	|.36|	31.3	(5.0)	21	32.7	(5.0)	16	.42	|.28|
Percent male*	50		28	62		21	.45	|.22|	45		22	62		16	.34	|.30|
Years of education for mother	13.7	(2.1)	28	13.2	(1.7)	21	.39	-.24	13.7	(2.1)	22	13.5	(1.8)	16	.73	-.10
Years of education for father	14.4	(2.0)	25	14.1	(2.2)	21	.62	-.15	14.5	(2.0)	21	14.7	(2.2)	16	.76	.14
Percent with both parents living at home	71		28	90		21	.15	.41	86		22	94		16	.63	.16
Percent of children who* are Caucasian	82		28	95		21	.26	|.31|	86		22	94		16	.63	|.16|
Hours per week mother* employed	9.0	(15.4)	28	7.2	(14.4)	21	.68	|.12|	8.9	(13.4)	22	8.6	(16.1)	16	.95	|.02|
Hours per week father* employed	38.3	(12.6)	23	40.5	(11.5)	18	.57	|.17|	40.1	(10.1)	20	40.6	(12.7)	15	.89	|.05|
Percent of mothers employed as technical/managerial or above	11		28	29		21	.13	.42	9		22	38		16	.05	.64
Percent of fathers employed as technical/managerial or above	25		28	38		21	.35	.26	27		22	52		16	.17	.43
Total Household income	$30,481	($23,251)	26	$32,775	($18,448)	20	.72	.10	$34,524	($33,250)	21	$34,700	($20,158)	15	.98	.01
Percent receiving public** assistance	15		27	19		16	.68	-.12	5		21	8		12	.61	-.18
Percent with mother as primary caregiver	96		25	95		19	.79	-.08	95		20	93		14	.74	-.11
Percent of children in* daycare more than 5 hours per week	11		28	05		21	.61	|.14|	14		22	6		16	.63	|.16|
Number of siblings*	.9	(.7)	28	1.2	(.9)	21	.23	|.45|	.9	(.8)	22	.9	(.9)	16	.91	|.00|
Percent with English as primary language	89		28	100		21	.28	.31	91		22	100		16	.47	.23

* Effect sizes reflect the magnitude of differences only

(continued)

** Direction of effect sizes is reversed to reflect the negative relationship to outcomes.

NOTE: Effect sizes from percentages were computed from a t statistic after an additional subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

Table 2.1 (continued)

Comparability of Groups on Demographic Characteristics for SMA/Lake McHenry Project

	Subjects Included in Year 4 Analyses (Based on Pretest Demographics)							
	Low Intensity			High Intensity				
Variables	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
Age of child in months at program entry	14.8	(6.2)	19	12.5	(5.8)	17	.26	-.37
Age of mother in years*	28.7	(5.1)	19	31.7	(4.4)	17	.07	|.59|
Age of father in years*	30.8	(5.2)	18	32.9	(4.6)	17	.21	|.40|
Percent male*	37		19	65		17	.12	|.50|
Years of education for mother	13.6	(2.0)	19	13.3	(1.8)	17	.65	-.15
Years of education for father	14.3	(2.0)	19	14.5	(2.2)	17	.77	.10
Percent with both parents living at home	84		19	88		17	.79	.08
Percent of children who* are Caucasian	94		18	94		17	.96	|.02|
Hours per week mother* employed	7.2	(11.9)	19	8.1	(15.7)	17	.84	|.08|
Hours per week father* employed	40.1	(10.4)	19	40.2	(13.1)	14	.97	|.01|
Percent of mothers employed as technical/managerial or above	5		19	35		17	.04	.67
Percent of fathers employed as technical/managerial or above	35		17	44		16	.65	.15
Total Household Income	$33,611	($22,775)	18	$32,688	($20,349)	16	.90	-.04
Percent receiving public** assistance	5		19	21		14	.21	-.42
Percent with mother as primary caregiver	94		18	93		15	.86	-.06
Percent of children in* daycare more than 5 hours per week	16		19	6		17	.47	|.23|
Number of siblings*	1.1	(0.8)	19	1.1	(0.9)	17	.98	|.00|
Percent with English as primary language	95		19	100		17	.63	.16

* Effect sizes reflect the magnitude of differences only.

(continued)

** Direction of effect sizes is reversed to reflect the negative relationship to outcomes.

NOTE: Effect sizes from percentages were computed from a t statistic after an additional subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

Table 2.2

Attrition Data for the SMA/Lake McHenry Intensity Study

								ANOVA					
		Low Intensity			High Intensity			Group		Study Status		Group by Status	
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p	F	p	F	p
POSTTEST #1													
CA at pretest	IN	15.0	(6.2)	31	13.7	(6.4)	29	2.08	.15	0.28	.60	0.69	.41
	OUT	15.6	(7.5)	8	10.8	(6.6)	4						
BDI DQ*	IN	52.3	(27.5)	31	60.8	(26.0)	29	0.01	.92	0.30	.58	0.69	.41
	OUT	64.9	(32.2)	8	58.2	(26.1)	4						
Total PSI**	IN	248.3	(44.0)	31	235.9	(43.9)	29	0.23	.63	0.88	.35	0.16	.70
	OUT	229.5	(34.2)	8	228.3	(27.0)	4						
FRS	IN	120.1	(25.7)	29	118.0	(15.7)	27	0.81	.37	0.05	.82	1.39	.24
	OUT	112.9	(18.9)	8	128.7	(3.2)	3						
FSS	IN	30.5	(12.9)	30	27.7	(9.4)	29	0.65	.42	0.01	.92	2.37	.13
	OUT	25.0	(8.8)	7	34.0	(15.3)	4						
Mother Education	IN	13.6	(2.0)	31	13.0	(1.6)	29	0.01	.93	0.01	.93	0.82	.37
	OUT	13.0	(1.5)	7	13.5	(1.7)	4						
Father Education	IN	14.3	(2.0)	28	13.7	(2.1)	29	0.27	.61	1.64	.21	0.10	.75
	OUT	13.1	(2.3)	7	13.0	(2.4)	4						
Income	IN	$30,190	($22,258)	29	$29,982	($17,253)	28	0.36	.55	1.41	.24	0.40	.53
	OUT	$18,000	($9,649)	6	$26,250	($16,520)	4						
Percent Male	IN	48.0		31	62.0		29	0.00	.97	0.00	.95	0.60	.44
	OUT	63.0		8	50.0		4						
POSTTEST #2													
CA at Pretest	IN	15.0	(6.4)	28	12.5	(5.6)	21	0.95	.33	0.72	.40	0.30	.59
	OUT	15.5	(6.9)	11	14.8	(7.5)	12						
BDI DQ*	IN	50.8	(28.4)	28	61.1	(25.2)	21	0.09	.76	0.86	.36	1.43	.24
	OUT	65.4	(27.5)	11	59.3	(27.3)	12						
Total PSI**	IN	246.8	(45.5)	28	243.0	(41.2)	21	0.98	.33	2.00	.16	0.40	.53
	OUT	238.5	(34.5)	11	221.1	(41.2)	12						
FRS	IN	120.5	(26.7)	26	116.9	(16.9)	21	0.35	.56	0.00	.95	1.52	.22
	OUT	113.9	(17.7)	11	124.1	(9.3)	9						
FSS	IN	29.3	(12.5)	27	26.9	(9.1)	21	0.04	.85	0.73	.40	0.38	.54
	OUT	30.0	(12.3)	10	31.3	(11.7)	12						
Mother Education	IN	13.7	(2.1)	28	13.2	(1.7)	21	0.45	.50	1.97	.17	0.12	.73
	OUT	12.9	(1.4)	10	12.8	(1.6)	12						
Father Education	IN	14.4	(2.0)	25	14.1	(2.2)	21	0.50	.48	5.72	.02	0.02	.89
	OUT	13.2	(2.2)	10	12.8	(1.7)	12						
Income	IN	$30,481	($23,251)	26	$32,775	($18,448)	20	0.26	.61	3.14	.08	0.00	.96
	OUT	$21,222	($11,111)	9	$24,083	($13,045)	12						
Percent Male	IN	50.0		28	62.0		21	0.37	.55	0.00	.97	0.10	.75
	OUT	55.0		11	58.0		12						

(continued)

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* Developmental quotients were computed by dividing the age equivalent scores by chronological age

** Lower scores on the Parent Stress Index are considered better.

Table 2.2 (continued)

Attrition Data for the SMA/Lake McHenry Intensity Study

								ANOVA					
		Low Intensity			High Intensity			Group		Study Status		Group by Status	
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p	F	p	F	p
POSTTEST #3													
CA at pretest	IN	15.8	(6.3)	22	12.4	(5.6)	16	1.27	.26	0.00	.99	1.18	.28
	OUT	14.2	(6.6)	17	14.1	(7.0)	17						
BDI DQ*	IN	55.0	(26.2)	22	61.1	(27.7)	16	0.72	.40	0.01	.91	0.01	.94
	OUT	54.8	(32.2)	17	59.8	(24.3)	17						
Total PSI**	IN	242.0	(48.3)	22	243.3	(46.8)	16	0.90	.35	0.27	.60	1.16	.29
	OUT	247.6	(34.6)	17	227.2	(36.4)	17						
FRS	IN	123.8	(27.3)	20	115.7	(17.0)	16	0.06	.81	0.18	.67	3.43	.07
	OUT	112.3	(19.2)	17	122.9	(12.4)	14						
FSS	IN	29.6	(10.7)	21	27.6	(9.2)	16	0.13	.72	0.06	.81	0.13	.72
	OUT	29.3	(14.5)	16	29.3	(11.2)	17						
Mother Education	IN	13.7	(2.1)	22	13.5	(1.8)	16	.80	.37	2.64	.11	0.13	.72
	OUT	13.2	(1.7)	16	12.6	(1.4)	17						
Father Education	IN	14.5	(2.0)	21	14.7	(2.2)	16	0.43	.52	10.71	.00	1.20	.28
	OUT	13.4	(2.2)	14	12.6	(1.5)	17						
Income	IN	$34,524	($23,249)	21	$34,700	($20,158)	15	0.54	.47	8.16	.01	0.49	.49
	OUT	$18,464	($12,707)	14	$24,941	($12,392)	17						
Percent Male	IN	46.0		22	63.0		16	0.50	.48	0.16	.69	0.50	.48
	OUT	59.0		17	59.0		17						
POSTTEST #4													
CA at Pretest	IN	14.8	(6.2)	19	12.5	(5.8)	17	1.34	.25	0.47	.49	0.13	.72
	OUT	15.4	(6.8)	20	14.1	(7.0)	16						
BDI DQ*	IN	56.8	(23.7)	19	61.1	(26.2)	17	0.70	.41	0.15	.70	0.03	.86
	OUT	53.1	(33.1)	20	59.7	(25.7)	16						
Total PSI**	IN	229.3	(34.1)	19	239.9	(41.4)	17	0.89	.35	.99	.32	4.17	.05
	OUT	258.9	(45.3)	20	229.8	(43.2)	16						
FRS	IN	126.4	(22.6)	18	117.0	(15.3)	17	0.02	.90	1.16	.29	4.08	.05
	OUT	111.0	(24.0)	19	121.7	(15.4)	13						
FSS	IN	33.1	(11.5)	19	27.8	(9.0)	17	0.11	.74	1.24	.27	2.64	.11
	OUT	25.7	(12.2)	18	29.2	(11.5)	16						
Mother Education	IN	13.6	(2.0)	19	13.3	(1.8)	17	1.07	.31	0.55	.46	0.14	.71
	OUT	13.4	(2.0)	19	12.8	(1.5)	16						
Father Education	IN	14.3	(2.0)	19	14.5	(2.2)	17	0.87	.36	6.37	.01	1.87	.18
	OUT	13.8	(2.2)	16	12.6	(1.5)	16						
Income	IN	$33,611	($22,775)	18	$32,688	($20,349)	16	0.12	.73	3.65	.06	0.29	.59
	OUT	$22,265	($17,910)	17	$26,344	($12,575)	16						
Percent Male	IN	37.0		19	65.0		17	0.66	.42	0.70	.41	2.42	.12
	OUT	65.0		20	56.0		16						

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* Developmental quotients were computed by dividing the age equivalent scores by chronological age

** Lower scores on the Parent Stress Index are considered better.

score on the Parenting Stress Index (PSI) (Abidin, 1986) were used to stratify the subjects prior to random assignment. (A more detailed description of the procedures utilized to randomly assign subjects can be found in the Base Period Report.)

Demographic characteristics. Data on the demographic characteristics of all subjects enrolled in the study, as well as subjects in the experimental and control groups who participated in Years 1, 2, 3, and 4 posttesting, are presented in Table 2.1. The total sample can be characterized as predominantly Caucasian and middle class. Most subjects lived in two-parent households in which fathers were employed full time and mothers were the primary caretakers for the child.

Intervention Programs

The two intervention groups received very similar types of service, but differed with regard to the frequency with which those services were provided, with the experimental group receiving three-times-per-week services and the control group receiving once-per-week services. The specific services provided are described below.

Basic intervention (once-per-week services). Children and primary caretakers in this group participated in a once-per-week contact with either an infant specialist (e.g., speech/language pathologist or occupational or physical therapist) or an early childhood special educator. While most contacts occurred at a center-based location, programs did allow the flexibility of conducting some of the contacts in the parent's home. Since the programs did not provide transportation to the children and their parents, the most common reason for providing a home visit was lack of transportation to the center. However, home visits were also provided when a particular teaching session could be most effectively accomplished in the home (e.g., when feeding or sleeping behaviors were of concern).

The content of the intervention sessions was directly related to the needs of the specific child and family as specified in the child's Individualized Education

Plan (IEP). No specific curriculum was followed unless the individual specialist or educator found that doing so would be particularly advantageous in meeting the child and family's specific needs. Thus, the specialists and educators had a great deal of freedom in determining the activities to be done during the individual sessions. In general, there was a program expectation that the sessions would focus on improving child development in the domains of personal/social, adaptive, motor, language, and cognitive functioning, and that the sessions would also help parents to become intervenors for their child.

A major goal of the sessions was to provide a forum for parents to discuss issues of concern to them and to help them adapt to daily demands of caring for a child with a disability. During the first year, funding from the Illinois State Board of Education allowed the programs to hold a number of inservices to provide staff with additional training in providing family-focused intervention services (e.g., Dunst, Trivette, & Deal, 1988). This training emphasized the importance of addressing parent-identified needs as well as strengths in an effort to empower parents to become capable of dealing with the demands of caring for a child with special needs rather than relying solely on professional helpers and helping systems.

Expanded intervention (three-times-per-week services). Children who were assigned to this group participated in three, one-hour contacts per week with a specialist or educator. The content and focus of the sessions were the same as that for the control group. The increased staff contact time allowed for a wider range of IEP goals to be addressed, and the more frequent contact allowed more parent concerns and issues to be incorporated into the treatment sessions.

Treatment verification. A number of procedures were used to verify that treatment was implemented as intended. First, attendance data and parent ratings of satisfaction with the program were examined. The three-day-per-week group received 2-½ times as many sessions as the basic group. Table 2.3 shows that this ratio held up for both years. In addition, the expanded group subjects were offered more than 2½ sessions per week in both years. It seems likely that the lower attendance rates observed are typical when more service hours are offered over time. Despite the statistical significance between attendance rates, and the lower than prescribed ratio of services, it seems clear from this data that the treatment was implemented as planned and that these figures represent the kind of attendance service deliverers should expect at these two levels of intensity.

Table 2.3

Treatment Verification for SMA/Lake-McHenry Project for Year #1 and #2 Posttests

	Basic Intervention			Expanded Intervention					
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ANOVA F	p Value	ES
POSTTEST #1									
Parent Rating of Satisfaction^	24.2	(4.2)	31	23.7	(3.2)	29	.31	.58	-.12
Rating of Intervention⁺									
Quality of Session	19.9	(8.1)	29	16.1	(7.3)	26	3.20	.08	-.47
Ranking of Intervenor	1.1	(.4)	28	1.2	(.4)	26	.24	.63	.25
Total # of Sessions Attended	26.9	(6.8)	31	63.7	(16.4)	29	132.60	.00	5.41
Total # of Sessions Offered	36.3	(4.8)	31	95.9	(13.5)	29	534.80	.00	12.42
Percent Attendance	74.1	(16.5)	31	66.8	(14.8)	29	3.25	.08	-.44
POSTTEST #2									
Parent Rating of Satisfaction^	24.3	(2.6)	27	24.9	(2.5)	21	.50	.48	.23
Total # of Sessions Attended	15.0	(7.8)	23	37.8	(24.2)	20	18.23	.00	2.92
Total # of Sessions Offered	19.9	(11.1)	23	53.4	(31.6)	20	22.75	.00	3.02
Percent Attendance	78.7	(14.4)	23	68.4	(19.1)	20	3.27	.08	-.64

+ Videotapes of a typical intervention session were scored by independent raters as to how well best practices were followed. Highest possible rating was 32.

^ Parents rated their satisfaction with the program in 7 areas on a scale of 1 = poor, 2 = fair, 3 = good, and 4 = excellent.

Parents were also asked to rate their satisfaction with services on a 4-point scale in 7 areas. Results indicate that parents of subjects in each group were equally satisfied in both Year 1 and Year 2.

At Year 1 posttest, videotapes of a typical treatment session were also rated to determine the extent to which the intervention represented 'best practices.' The highest possible rating was 32. The results of group comparisons on these variables are contained in Table 2.3. The quality of intervention was ranked slightly higher for the control group. There was no statistically significant difference in the ranking of intervenors by their supervisors, or in the parents' satisfaction with services. Thus, the results obtained from the video rating seem to be a product of random fluctuation and the typically lower reliability associated with rating scales.

Contextual Variables. In addition to the attendance and parent satisfaction data, variables describing the context of the intervention for both groups were collected each year and are reported in Table 2.4. These contextual variables are presented in 5 sections for years 1 and 2, and 4 sections for years 3 and 4. As can be seen, only one variable other than the teacher rating of parents was statistically significantly different across groups. That variable was the amount of speech therapy received during Year 2. One statistically significant variable is less than one would expect from simple random chance for the many variables reported in this table. Therefore, it seems that these groups had an almost identical history of context for all four years of this study.

The differential results indicated by the teacher rating of parents shows that the parents of subjects in the expanded group demonstrated more support in Year 1 and had more knowledge appropriate for the benefit of their child in Years 1 and 2. This would be another indication that the treatment was delivered as planned. Overall, the contextual variables show how comparable the groups' experiences have been outside of treatment over the course of this study.

Cost of alternative interventions. Program costs were calculated using the ingredients approach (Levin, 1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as

Table 2.4

Comparison of Contextual Variables for Basic and Expanded Intervention Groups for SMA/Lake McHenry Project

	Basic Intervention			Expanded Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
POSTTEST #1								
• **Child Health**[^]	2.0	(0.5)	31	1.8	(0.5)	29	.32	-.40
• **Demographics**								
Percent child living with both parents	79		29	93		29	.17	.35
Mothers' employment hrs/week	10.0	(18.4)	30	11.4	(17.1)	27	.77	.08
Annual Income	$29,661	($22,310)	31	$31,333	($19,497)	27	.76	.07
• **Family Variables**								
Family Resources (FRS)[&]	119.0	(23.8)	31	121.0	(15.1)	29	.71	.08
Family Life Events (FILE)[&]	10.3	(6.2)	31	11.1	(6.6)	29	.63	-.13
• **DDI Teacher Rating of Parents**[$]								
Attendance	2.5	(0.7)	31	2.6	(0.6)	29	.66	.14
Support	2.4	(0.7)	31	2.8	(0.4)	29	.03	.57
Knowledge	2.1	(0.7)	31	2.5	(0.6)	29	.03	.57
• **Additional Services (Percent Received)**[#]								
> 5 hours/week daycare	19		31	24		29	.67	-.11
Speech Therapy	16		31	21		29	.67	-.11
Physical or Occupational Therapy	32		31	21		29	.35	.24
Social Work Services	0		31	7		29	.28	-.27
Home Nursing Services	7		31	17		29	.24	-.29
Nutritional Services	3		31	10		29	.36	-.29
Respite Services	10		31	3		29	.45	.19
Parent Services	23		31	17		29	.65	.12
POSTTEST #2								
• **Child Health**[^]	1.9	(0.4)	27	1.9	(0.5)	21	.81	.00
• **Demographics**								
Percent child living with both parents	70		27	86		21	.27	.31
Mothers' employment hrs/week	9.5	(17.2)	28	9.8	(13.7)	21	.95	.02
Annual Income	$33,107	($24,273)	28	$40,588	($27,436)	18	.34	.31
• **Family Variables**								
Family Resources (FRS)[&]	119.0	(18.2)	28	120.1	(19.2)	21	.83	.06
Family Life Events (FILE)[&]	9.6	(7.2)	28	10.8	(5.9)	20	.55	-.17
• **DDI Teacher Rating of Parents**[$]								
Attendance	2.6	(0.8)	12	2.8	(0.6)	14	.46	.25
Support	2.6	(0.5)	12	2.7	(0.6)	14	.56	.20
Knowledge	2.5	(0.7)	12	2.9	(0.3)	14	.04	.57
• **Additional Services (Percent Received)**[#]								
> 5 hours/week daycare	21		28	22		18	.89	-.04
Speech Therapy	27		26	63		19	.02	-.70
Physical or Occupational Therapy	50		26	58		19	.63	-.14
Social Work Services	8		26	0		19	.47	.21
Respite Services	15		26	37		19	.11	-.46

(continued)

[$] Data are based on teacher rating of parents' attendance, support, and knowledge range (1-3). Higher scores indicate better ratings.

[&] Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for the FILE are based on raw scores. Lower scores represent less stress and are considered better.

[#] Annually, parents completed an additional services form which described other types of intervention or additional services the child and family received.

[^] Based on parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers

NOTE: ESs from percentages were computed from a *t* statistic after a subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

Table 2.4 (continued)

Comparison of Contextual Variables for Basic and Expanded Intervention Groups for SMA/Lake McHenry Project

	Basic Intervention			Expanded Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
POSTTEST #3								
• **Child Health^**	2.0	(0.6)	22	1.9	(0.6)	17	.94	-.17
• **Demographics**								
Percent child living with both parents	77		22	82		17	.77	.09
Mothers' employment hrs/week	10.4	(16.8)	21	12.8	(15.3)	17	.65	.14
Annual Income	$41,659	($23,260)	22	$49,000	($26,268)	15	.38	.32
• **Family Variables**								
Family Resources (FRS)&	121.4	(17.2)	22	118.9	(14.4)	15	.65	.15
Family Life Events (FILE)&	9.8	(7.6)	22	10.5	(7.5)	15	.78	-.09
• **Additional Services (Percent Received)#**								
Speech Therapy	26		23	24		17	.90	.04
Physical or Occupational Therapy	35		23	24		17	.51	.20
Social Work Services	4		23	0		17	.73	.11
Respite Services	18		22	35		17	.25	-.35
POSTTEST #4								
• **Child Health^**	1.9	(0.4)	19	1.9	(0.6)	15	.66	.00
• **Demographics**								
Percent child living with both parents	76		17	88		16	.50	.23
Mother's employment hrs/week	12.4	(15.0)	16	15.2	(18.0)	14	.65	.19
Annual Income	$43,563	($21,167)	16	$47,333	($27,734)	15	.67	.18
• **Family Variables**								
Family Resources (FRS)&	120.1	(16.9)	13	119.6	(17.5)	13	.86	-.03
Family Life Events (FILE)&	9.5	(5.6)	16	7.8	(7.1)	15	.46	.30
• **Additional Services (Percent Received)#**								
> 5 hours/week daycare	26		19	35		17	.60	-.17
Speech Therapy	53		17	50		16	.87	.05
Physical or Occupational Therapy	59		17	50		16	.65	.15
Social Work Services	6		17	0		16	.60	.18
Respite Services	6		17	19		16	.35	-.31

& Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for the FILE are based on raw scores. Lower scores represent less stress and are considered better.

Annually, parents completed an additional services form which described other interventions or additional services the child and family received.

^ Based on parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers

NOTE: ESs from percentages were computed from a *t* statistic after a subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition, total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time. Table 2.5 summarizes average cost per child for 3 days per week versus 1 day per week in the SMA and Lake McHenry locations. These two programs were used as the basis for the calculations since they served the majority of the children included in the project.

Table 2.5

Costs per Child for SMA/Lake McHenry (1990 Dollars)

	1 x per week	3 x per week
1. **UNDISCOUNTED COSTS:**		
Direct Services	$2,293	$ 5,561
Administration	979	2,937
Facilities	210	631
Equipment	59	178
Materials/Supplies	83	251
Transportation	83	248
Utilities, Insurance, Miscellaneous	103	308
TOTAL	**$3,810**	**$10,114**
2. **DISCOUNTED COSTS (3%):**		
Total Resources	$ 4,163	$11,052
3. **DISCOUNTED COSTS (5%):**		
Total Resources	4,411	$11,708

* *Totals may not equal due to rounding errors*

Data Collection

All subjects were tested at program entry and then again after one, two, three, and four years of intervention. Table 2.6 indicates the schedule of assessment for the pretest and the four posttests. Table 2.7 gives a simple description of each of the dependent and contextual measures used for testing. Data collection procedures are described below.

Diagnosticians. Two diagnosticians were hired to complete pretesting and Year #1 posttesting. These diagnosticians were not employed by any of the participating programs, and were not informed of the purpose of the study or of the group assignment of the subjects. They were trained to administer the measures by staff of the Early Intervention Research Institute. Scheduling of subjects and monitoring of diagnosticians was coordinated by staff of the SMA program, who also had overall responsibility for coordinating the project for the State of Illinois. Eight diagnosticians were used to complete Years 2, 3, and 4 posttesting. All were graduate students in School Psychology at the University of Wisconsin--Milwaukee (UWM) who successfully met EIRI certification requirements for diagnosticians. Assessment coordination was the responsibility of Dr. McLinden at UWM.

Table 2.6

Schedule of Administration and Test Administration for SMA/Lake McHenry Intensity Study

	Pretest	Posttest #1	Posttest #2	Posttest #3	Posttest #4
CHILD MEASURES					
Battelle Developmental Inventory	X	X	X	X	X
Bayley Scales		X			
Wisconsin	X	X			
Scales of Independent Behavior			X		
Child Behavior Checklist				X	
FAMILY MEASURES					
Parent Stress Index	X	X	X	X	X
Family Support Scale	X	X	X	X	X
Family Resource Scale	X	X	X	X	X
Family Inventory of Life Events and Changes	X	X	X	X	X
Family Adaption and Cohesion Evaluation Scales	X	X	X	X	X
Comprehensive Evaluation of Family Functioning			X	X	X

Table 2.7

Description of Tests Administered for SMA/Lake McHenry Intensity Study

MEASURES	DESCRIPTION
CHILD MEASURES	
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1985)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: motor skills, social and communication skills, personal living skills, and community living skills.
Bayley Scales of Infant Development (Bayley, 1969)	A norm-referenced test which measures infant mental and motor development. It is completed using child administration and parent interview.
Wisconsin Behavior Rating Scale (WBRS) (Song, Jones, Lippert, Metzgen, Miller, & Borreca, 1984)	A norm-referenced and criterion-referenced test which assesses basic survival skills in 11 areas.
Child Behavior Checklist (Achenbach & Edelbrock, 1986)	A norm-referenced test which assesses problem behaviors and competencies through parent report.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1986)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst, & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: general resources, time availability, physical resources, and external support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, marital, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
Comprehensive Evaluation of Family Functioning (CEFF) (McLinden, 1989)	Assesses areas in which a family having a child with special needs may be affected. Areas assessed are: time demands, acceptance, coping, social relationships, financial demands, well-being, and sibling relationships.

Interobserver agreement was calculated for eight BDI administrations and two Bayley administrations. Mean percent agreement was 92.4% for the BDI, 94% for the Bayley Mental Scale, and 100% for the Bayley Motor Scale.

Pretest data collection. Pretesting was accomplished in two phases. The first phase of pretest data collection occurred at the time that parents consented to participate in the study. At that time, parents completed the Parenting Stress Index, and the educator or specialist assigned to the family's case completed the Wisconsin Behavior Rating Scale. These data were then used for stratification purposes during random assignment.

After the subjects had been assigned to a group, the diagnostician contacted the parent and scheduled a testing session to complete the remainder of the pretest battery, consisting of the Battelle Developmental Inventory (BDI), the Family Support Scale (FSS), Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and Family Adaptability and Cohesion Evaluation Scales (FACES III). Testing occurred at one of the program sites closest to the parent's home, although in some instances it was necessary to schedule testing at the home. Parents were paid $20 to participate in the approximately 1½ hour testing session. Most subjects were tested within two weeks of their assignment to groups.

Year 1 posttesting. Posttesting was scheduled 12 months after the date upon which the subject first entered services. However, the average amount of time between pre- and posttesting was less than 12 months, due primarily to delays in pretesting some of the children. The time between pre- and posttesting did not, however, differ significantly across groups.

The posttest battery consisted of a large number of child and family measures, which necessitated the scheduling of two separate testing sessions. The first session, which lasted approximately 1-3/4 to 2-1/4 hours and for which parents were paid $20, included the administration of the BDI, PSI, FILE, FRS, FSS, and FACES III. The second session, which lasted approximately 1½ hours and for which parents were paid $15, included the administration of the Bayley Scales of Infant Development, Parent Survey Form, Parent Report of Child's Health, and Parent Satisfaction with

Services. A videotape of an interaction session between the child and his/her primary caregiver was also made at this time. Each child's specialist or educator also completed the Wisconsin Behavior Rating Scale at the time of the Year 1 posttest.

Year 2 posttesting. Subjects were tested again two years after their initial program entry date. The posttest battery was administered in two sessions in a manner similar to Year 1 posttesting. Year 2 posttesting differed from Year 1 posttesting as follows: (1) The Scales of Independent Behavior replaced the Bayley Scales and the Wisconsin Behavior Rating Scale as a child outcome measure, (2) Fathers and mothers completed the Comprehensive Evaluation of Family Functioning Scale, and (3) Fathers completed the FSS and FACES III.

Year 3 posttesting. Subjects were tested again three years after their initial program entry date. The posttest battery was administered in only one session. Some of the parent forms (parent survey, satisfaction questionnaire, and health form) were sent to the parents to be completed before the testing session, and data on additional services were collected by the assessment coordinator in a phone call with the parent after testing had been completed. One other measure (teacher rating form) was completed by the child's current teacher. Other measures for Year 3 posttesting included the Child Behavior Checklist and the CEFF (completed by both mothers and fathers). Fathers also completed the FSS and FACES III.

Year 4 posttesting. Subjects were tested again four years after their program entry date. The posttest battery for child measures was again done in one session. And as in previous years, some of the parent forms were sent to parents to be completed before the testing session. All measures used in Year 3 testing were again used in Year 4 testing with one exception. The CEFF was only filled out by the mothers.

Results and Discussion

Pretest Comparisons

Results of comparisons of the Expanded and Basic Services groups on the measures collected at pretest for all subjects as well as those subjects included in Year 1, Year 2, Year 3, and Year 4 analyses are presented in Table 2.8. The p values presented in the table are based on one-way analysis of variance. With only two exceptions, the FACES III adaptive score with all pretested subjects, and the FILE for subjects used in Years 3 and 4 testing, an examination of these values indicates that, at pretest, experimental and control groups were not statistically significantly ($p < .10$) different on any of the measures of child or family functioning and that attrition did not significantly affect the comparability of groups at Years 1, 2, 3, or 4. The few differences observed are accounted for in the analysis using them as covariates when appropriate.

Selection of Covariates

The choice of covariates for the analysis procedures was done using three methods. First, demographic, contextual, and outcome variables in which groups differed at pretest were considered as possible covariates. They were used if their correlation with the outcome measure indicated that there was a sufficient relationship to adjust means to account for the pretreatment differences. If the correlation was insignificant, then the variable was not used as a covariate.

Second, in the case of child measures, raw scores were analyzed; thus, age was used as a covariate. This eliminated the need for age adjusted scores and developmental quotients which were not appropriately normed for samples with severe disabilities.

Finally, variables which correlated with the outcome variable to make at least a marginal increase in power were included as covariates. If two related variables made this list, then the most appropriate was chosen. The statistical overlap would

Table 2.8

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	All Pretested Subjects										Subjects Included in Year #1 Posttest										
	Basic Intervention				Expanded Intervention						Basic Intervention				Expanded Intervention						
Variable	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	ES^	P Value	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	ANOVA F	ES^	P Value
● Age in months at pretest	15.1	(6.4)		39	13.3	(6.4)		33	-.28	.24	15.2	(6.1)		18	12.5	(5.8)		17	1.78	-.44	.19
● **Battelle Developmental* Inventory (BDI)**																					
Raw Scores for:																					
Personal Social	30.9	(16.5)		39	31.0	(16.4)		33	.01	.98	30.4	(16.1)		31	31.6	(16.8)		29	.08	.07	.78
Adaptive Behavior	25.2	(13.6)		39	24.8	(13.1)		33	-.03	.92	24.0	(13.3)		31	25.2	(13.0)		29	.13	.09	.72
Motor	34.7	(26.3)		39	32.5	(23.1)		33	-.08	.72	32.9	(25.0)		31	32.0	(23.1)		29	.00	-.04	.99
Communication	16.6	(8.0)		39	16.9	(9.0)		33	.04	.86	16.2	(7.9)		31	17.3	(9.3)		29	.25	.14	.62
Cognitive	14.8	(9.1)		39	15.2	(8.4)		33	.04	.86	14.5	(9.0)		31	15.6	(8.3)		29	.23	.12	.64
TOTAL	122.2	(71.6)		39	120.5	(67.5)		33	-.02	.92	117.9	(69.2)		31	122.5	(67.7)		29	.07	.07	.80
● **Parenting Stress Index**%♠ **(PSI)** Percentile Rank																					
Child Related (range 47 to 235)	117.3	(27.1)		39	110.3	(19.8)		33	.26	.22	119.9	(28.0)	88	31	111.1	(19.9)	76	29	1.94	.31	.17
Other Related (range 54 to 270)	127.1	(23.1)		39	124.7	(28.7)		33	.10	.70	128.4	(24.8)	63	31	124.8	(30.5)	58	29	.25	.15	.62
TOTAL (range 101 to 505)	244.4	(42.4)		39	235.0	(41.9)		33	.22	.35	248.3	(44.0)	78	31	235.9	(43.9)	67	29	1.18	.28	.28
● **Family Adaptation and**+ **Cohesion Evaluation Scales (FACES)**																					
Adaptation	21.1	(5.2)		38	24.7	(6.3)		33	.69	.07	22.1	(5.4)		30	24.6	(6.3)		29	1.10	.46	.11
Cohesion	38.1	(7.9)		38	37.6	(7.0)		33	-.06	.79	37.4	(7.7)		30	38.1	(6.8)		29	.01	.09	.69
● **Family Resource Scale**%& **(FRS)**	118.5	(24.3)		37	119.0	(15.2)		30	.02	.92	120.1	(25.7)	54	29	118.0	(15.7)	50	27	.13	-.08	.71
● **Family Index of Life**♠% **Events (FILE)**	11.3	(7.9)		38	12.6	(7.2)		33	-.16	.47	10.9	(8.1)	34	30	12.6	(6.0)	24	29	.75	-.21	.39
● **Family Support Scale**%& **(FSS)**	29.5	(12.3)		37	28.5	(10.2)		33	-.08	.71	30.5	(12.9)	63	30	27.7	(9.4)	50	29	.91	-.22	.34

(continued)

♠ Statistical analysis and Effect Size (ES) for PSI and FILE were based on raw scores where low raw scores and positive ES are most desirable.

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

% No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal studies (currently, 645 families with children with disabilities).

^ Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the X̄ scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analysis for BDI scores was conducted using raw scores for each of the scales.

+ Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

Table 2.8 (continued)

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	Subjects included in Year #2 Posttest											Subjects Included in Year #3 Posttest										
	Basic Intervention				Expanded Intervention							Basic Intervention				Expanded Intervention						
Variable	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ES^	P Value	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ES^	P Value
● Age in months at pretest	15.0	(6.4)		28	12.5	(5.6)		21	2.02	-.39	.16	15.8	(6.3)		22	12.4	(5.6)		16	2.88	-.54	.10
● **Battelle Developmental Inventory (BDI)**[*]																						
Raw Scores for:																						
Personal Social	30.4	(16.9)		28	28.1	(12.4)		21	.26	-.14	.62	33.9	(16.8)		22	28.2	(14.1)		16	1.23	-.34	.27
Adaptive Behavior	23.5	(13.6)		28	23.4	(9.3)		21	.00	-.01	.98	26.1	(13.8)		22	23.4	(10.0)		16	.42	-.20	.52
Motor	31.7	(25.9)		28	29.0	(17.0)		21	.17	-.10	.68	36.2	(27.3)		22	29.8	(19.2)		16	.66	-.23	.42
Communication	15.9	(8.3)		28	14.8	(6.9)		21	.25	-.13	.62	17.5	(8.3)		22	14.3	(7.0)		16	1.56	-.39	.22
Cognitive	14.2	(9.3)		28	14.5	(6.4)		21	.02	.03	.89	16.0	(9.0)		22	14.3	(6.9)		16	.37	-.19	.55
TOTAL	115.6	(72.1)		28	109.9	(48.1)		21	.10	-.08	.75	129.7	(73.5)		22	110.0	(53.4)		16	.83	-.27	.37
● **Parenting Stress Index (PSI) Percentile Rank**[♠]																						
Child Related (range 47 to 235)	120.9	(29.3)		28	115.0	(16.5)		21	.70	.20	.37	118.6	(30.1)		22	115.1	(17.6)		16	.17	.12	.66
Other Related (range 54 to 270)	125.9	(24.0)		28	128.0	(32.0)		21	.07	-.09	.79	123.4	(26.2)		22	128.2	(36.7)		16	.22	-.18	.64
TOTAL (range 101 to 505)	246.8	(45.5)		28	243.0	(41.2)		21	.09	.08	.76	242.0	(48.3)		22	243.3	(46.8)		16	.00	-.03	.93
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]																						
Adaptation	22.6	(5.3)		27	23.6	(6.7)		21	1.73	.19	.59	24.0	(4.8)		21	23.7	(7.0)		16	.03	-.06	.85
Cohesion	38.3	(7.2)		27	37.6	(6.4)		21	.04	-.10	.72	39.0	(7.7)		21	38.0	(6.8)		16	.15	-.13	.70
● **Family Resource Scale (FRS)**[%&]	120.5	(26.7)		26	116.9	(16.9)		21	.29	-.13	.59	123.8	(27.3)		20	115.7	(17.0)		16	1.08	-.30	.31
● **Family Index of Life Events (FILE)**[♠%]	10.7	(8.6)		27	13.2	(6.2)		21	1.27	.29	.27	9.9	(6.6)		21	13.6	(6.5)		16	2.99	-.56	.09
● **Family Support Scale (FSS)**[%&]	29.3	(12.5)		27	26.9	(9.1)		21	.54	-.19	.46	29.6	(10.7)		21	27.6	(9.2)		16	.36	-.19	.55

(continued)

[♠] Statistical analysis and Effect Size (ES) for PSI and FILE were based on raw scores where low raw scores and positive ES are most desirable.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal studies (currently, 645 families with children with disabilities).

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the $\bar{X}$ scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

[*] Statistical analysis for BDI scores was conducted using raw scores for each of the scales.

[+] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

Table 2.8 (continued)

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	Subjects Included in Year #4 Posttest										
	Basic Intervention				Expanded Intervention						
Variable	x̄	(SD)	%ile	n	x̄	(SD)	%ile	n	ANOVA F	ES^	p Value
• **Age in months at pretest**	14.8	(6.2)		19	12.5	(5.8)		17	1.33	-.37	.26
• **Battelle Developmental[•] Inventory (BDI)**											
Raw Scores for:											
Personal Social	32.8	(15.7)		19	27.5	(10.6)		17	1.38	-.34	.25
Adaptive Behavior	24.9	(12.1)		19	23.0	(8.4)		17	0.29	-.16	.59
Motor	33.2	(25.4)		19	27.7	(15.5)		17	0.59	-.22	.45
Communication	17.2	(7.5)		19	14.9	(6.9)		17	0.85	-.31	.36
Cognitive	15.8	(7.9)		19	14.5	(6.5)		17	0.27	-.16	.61
TOTAL	123.8	(66.8)		19	107.6	(43.5)		17	0.72	-.24	.40
• **Parenting Stress Index[♠] (PSI) Percentile Rank**											
Child Related (range 47 to 235)	110.4	(18.7)		19	112.5	(17.0)		17	0.12	-.11	.73
Other Related (range 54 to 270)	118.9	(22.4)		19	127.5	(29.8)		17	0.96	-.38	.33
TOTAL (range 101 to 505)	229.3	(34.1)		19	239.9	(41.4)		17	0.72	-.31	.41
• **Family Adaptation and[+] Cohesion Evaluation Scales (FACES)**											
Adaptation	24.1	(5.0)		19	23.3	(6.8)		17	0.15	-.16	.71
Cohesion	40.1	(5.0)		19	37.7	(6.9)		17	1.46	-.48	.24
• **Family Resource Scale[%♣] (FRS)**	126.4	(22.6)		18	117.0	(15.3)		17	2.07	-.42	.16
• **Family Index of Life[♠%] Events (FILE)**	9.6	(5.8)		19	13.2	(5.9)		17	3.29	-.62	.08
• **Family Support Scale[%♣] (FSS)**	33.1	(11.5)		19	27.8	(9.0)		17	2.26	-.46	.14

[♠] Statistical analysis and Effect Size (ES) for PSI and FILE were based on raw scores where low raw scores and positive ES are most desirable.

[♣] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal studies (currently, 645 families with children with disabilities).

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

[•] Statistical analysis for BDI scores was conducted using raw scores for each of the scales.

[+] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

serve to negate the attempted increase in power. In as many cases as possible, at least one demographic, one child functioning, and one family variable was used as covariates. This increase in power was included to demonstrate that even under the most liberal statistical conditions, differences were very hard to detect. In addition, this increase in power helped offset the loss of power due to attrition. For sample sizes obtained at Year 4 posttsting, the power (i.e., the ability to detect differences) obtained to detect moderate effects (in this case, effect sizes of .50 or better) were approximately 45%. With covariates producing a multiple of $\underline{R}$ .70, as was the case for most of the child measures analysis, power increased to over 90%. Thus, despite the attrition, the ability to detect even moderate differences was substantial.

Posttest Analyses for Year 1

Results of group comparisons on child outcome measures for Year 1 are presented in Table 2.9. Analysis of the data for the three measures of child functioning--BDI, Wisconsin, and Bayley Scales--indicated that there were no statistically significant differences between the groups in favor of the more intensive group after one year of intervention.

However, all of the effect sizes for child functioning as measured by the Battelle and the Bayley were negative. This indicated that across all domains, the less intensive group scored higher after adjusting for pretreatment differences and the age of each child. Additionally, three of these variables, including the total score on the Battelle, showed a statistically significant difference in favor of the basic group.

Results of the group comparisons for the family outcome measures for Year One are presented in Table 2.10. Statistically significant group differences were found on the Family Support Scale. Mother's FSS total score for adequacy of support was higher (p = .04) for the mothers in the expanded intervention than for those in the

Table 2.9

Year 1 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

Variable	Covariates♦	Basic Intervention				Expanded Intervention				ANCOVA F	ES	p Value
		$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n			
Average Length of Time between Pretest & Posttest		10.7	(1.8)		31	10.4	(2.6)		29	.21	.17	.65
Age in months at Posttest		25.1	(6.3)		31	24.2	(7.3)		29	1.42	.14	.24
Battelle Developmental^ Inventory Raw Scores for:												
Personal/Social	1,2,3	50.5	(26.1)	52.7	31	49.0	(23.0)	46.9	29	6.24	-.22	.02
Adaptive Behavior	1,2,3	36.4	(17.3)	38.0	31	37.4	(14.5)	35.9	29	2.13	-.12	.15
Motor	1,2,3	54.7	(31.2)	57.4	31	52.1	(26.6)	49.4	29	5.23	-.26	.03
Communication	1,2,3	26.6	(13.3)	27.8	31	27.4	(11.8)	26.2	29	1.33	-.12	.25
Cognitive	1,2,3	22.6	(12.4)	23.7	31	23.7	(9.6)	22.6	29	1.10	-.09	.30
Total	1,2,3	190.9	(97.9)	199.6	31	189.7	(81.6)	181.0	29	6.41	-.19	.01
Bayley Scales^												
Mental	2,3,4	104.3	(51.9)	109.7	31	112.5	(38.3)	107.0	29	.22	-.05	.64
Motor	2,3,5	46.2	(23.0)	47.6	31	47.2	(18.0)	45.8	29	.82	-.08	.37
Wisconsin												
Deviation Score	3,6	.6	(.4)	.6	31	.7	(.3)	.7	29	.30	.11	.59
Behavior Age	2,3,7	16.2	(10.6)	16.1	31	16.2	(9.5)	16.3	29	.02	.02	.89

♦ 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Battelle cognitive raw score (pretest), 5 = Battelle total motor raw score (pretest), 6 = Wisconsin deviation score (pretest), 7 = Wisconsin behavior age score (pretest)

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.10

Year 1 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

Variable	Covariates♦	Basic Intervention				Expanded Intervention				ANCOVA F	ES	p Value
		$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n			
• **Parenting Stress Index***												
Child	1,2,3	119.2	(20.6)	118.8	31	110.9	(22.8)	111.8	29	2.84	.34	.10
Parent	1,2,3	128.0	(26.5)	127.2	31	130.9	(35.5)	132.5	29	.75	-.20	.39
Total	1,2,3	247.2	(40.5)	245.9	31	241.9	(52.6)	244.4	29	.04	.04	.85
• **Family Adaptation and** **Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	4,6,7	22.9	(5.7)	23.2	31	23.2	(6.5)	22.3	29	.50	.16	.48
Cohesion	5,6	38.7	(6.8)	38.9	31	39.3	(4.8)	38.8	29	.01	.01	.92
• **Family Support Scale (FSS) - Mother**	6,8	26.9	(10.2)	26.3	31	29.8	(10.4)	30.6	29	4.40	.42	.04

♦ 1 = PSI Total (pretest), 2 = FILE (pretest), 3 = Ethnicity of child (Caucasian/non-Caucasian), 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Maternal age, 7 = Battelle total raw score (pretest), 8 = Family support scale (pretest)

* Lower scores on the Parent Stress Index are considered better.

** Raw scores for the FACES were used and higher scores are considered better.

control group. This indicates that mothers who participated in services three times per week reported higher levels of helpfulness for available sources of support than did mothers who participated in services once per week. There were no statistically significant differences on any of the other family measures.

Videotapes of parent/child interactions were obtained for 62 subjects during Year 1. EIRI contracted with several researchers who had developed scoring systems for such videotapes in order to have them independently analyzed (Kofi Marfo, Gerald Mahoney, and Dale Farran). This arrangement ensured that the tapes would be analyzed by people who were thoroughly familiar with the scoring system being used and were uninformed about the group membership of participating subjects.

The results of the Marfo analysis of the parent-child interaction are included in Table 2.11. Out of 35 variables tested, a statistically significant difference was found for only one--*Child Complies with Mother's Verbal Instruction.* This is no more than would be expected to be found by chance when so many variables are being tested. The results of the Farran and Mahoney analyses of the parent/child interaction tapes are included in Table 2.12 and 2.13, respectively. There were no statistically significant differences between the groups on any of the variables coded in these analyses. Thus, it does not appear that there are meaningful differences at Year 1 between the two groups in terms of parent/child interaction as rated by Marfo, Mahoney, and Farran.

Subgroup Analyses for Year 1

To examine the relative effectiveness of once-per-week versus three-times-per-week services two subgroup analyses were conducted. The first of these excluded subjects with mild disabilities. The remaining subjects functioned at overall developmental levels more than two standard deviations below average. In the second subgroup analysis, only those children attending their respective programs more than two-thirds of the time were included. Although a variety of attendance rates would

Table 2.11

Year 1 Posttest Analyses for Videotapes of Parent/Child Interaction Analysis for SMA/Lake-McHenry

	Low Intensity			High Intensity				
Variables	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ANCOVA F	p Value
• Parent verbal mand	4.1	(4.6)	26	3.9	(1.2)	25	.03	.87
• Parent nonverbal mand	.2	(.3)	26	.2	(.2)	25	.31	.58
• Parent verbal response	1.0	(.6)	26	1.1	(.4)	25	.49	.49
• Parent nonverbal response	.2	(.3)	26	.2	(.2)	25	.21	.64
• Parent verbal response mand	.2	(.3)	26	.2	(.1)	25	.16	.69
• Parent nonverbal response mand	.0	(.0)	26	.0	(.0)	25	2.19	.14
• Parent verbal unlinked	1.9	(1.1)	26	1.7	(.6)	25	.21	.65
• Parent nonverbal unlinked	1.3	(.7)	26	1.3	(.4)	25	.34	.56
• Child verbal mand	.1	(.3)	26	.1	(.2)	25	.12	.73
• Child nonverbal mand	.1	(.2)	26	.2	(.2)	25	1.09	.30
• Child verbal response	1.3	(3.9)	26	.5	(.8)	25	1.03	.31
• Child nonverbal response	1.8	(.9)	26	1.9	(.6)	25	.16	.69
• Child verbal response mand	.0	(.0)	26	.0	(.0)	25	.96	.33
• Child nonverbal response mand	.0	(.0)	26	.0	(.0)	25	--	--
• Child verbal unlinked	.0	(.1)	26	.0	(.0)	25	.01	.90
• Child nonverbal unlinked	1.4	(.7)	26	1.5	(.5)	25	.21	.65
• Parent initiates topic	.9	(.5)	26	.9	(.2)	25	.01	.91
• Parent follows topic	.3	(.4)	26	.4	(.2)	25	.18	.67
• Child follows topic	.7	(.5)	26	.7	(.2)	25	.00	.94
• Child initiates topic	.4	(.4)	26	.5	(.2)	25	1.27	.26
• Parent verbal inhibition	.1	(.1)	26	.1	(.1)	25	1.69	.20
• Parent nonverbal inhibition	.1	(.1)	26	.1	(.1)	25	.89	.35
• Parent intrusion (inadvertent)	.1	(.1)	26	.1	(.1)	25	1.41	.24
• Child complies with verbal inhibition	.0	(.1)	26	.1	(.1)	25	4.51	.04*
• Child complies with nonverbal inhibition	.1	(.1)	26	.1	(.1)	25	3.04	.09
• Parent standard imperative	1.8	(.8)	26	2.2	(.7)	25	3.56	.06
• Parent embedded/implied directive	.6	(.7)	26	.7	(.4)	25	.11	.74
• Child complies with standard imperative	.9	(.4)	26	1.0	(.4)	25	1.25	.27
• Child complies with embedded/implied directive	.4	(.7)	26	.2	(.2)	25	.85	.36
• Parent labels	.4	(.2)	26	.4	(.2)	25	.06	.80
• Parent expands	.1	(.1)	26	.0	(.1)	25	.66	.42
• Parent gives information	.6	(.5)	26	.6	(.3)	25	.00	.97
• Parent requests information	1.5	(2.4)	26	1.2	(.7)	25	.29	.59
• Parent models	.7	(.3)	26	.8	(.5)	25	1.23	.27
• Parent reinforces	.4	(.3)	26	.3	(.3)	25	.07	.79

Table 2.12

Year 1 Posttest Parent/Child Interaction Ratings by Farran for Alternative Intervention Groups for SMA/Lake McHenry

Variable	Basic Intervention			Expanded Intervention			ANOVA F	P Value
	X̄	(SD)	n	X̄	(SD)	n		
AMOUNT								
1. Principal Involvement	2.9	(1.30)	21	3.2	(1.20)	18		
2. Verbal Involvement	3.5	(.68)	21	3.4	(.70)	18		
3. Responsiveness of Caregiver	3.2	(.81)	21	3.7	(.59)	18		
4. Play Interaction	3.6	(.92)	21	3.6	(.78)	18		
5. Teaching Behavior	1.2	(.44)	21	1.2	(.38)	18		
6. Control Activities	3.6	(.92)	21	3.7	(.90)	18		
7. Directiveness, Demands	2.8	(.89)	21	3.2	(1.00)	18		
8. Relationship Among Activities	3.9	(.77)	21	3.9	(.83)	18		
9. Positive Statements, Regard	2.2	(.99)	21	2.4	(.85)	18		
10. Negative Statements, Regard	1.9	(.89)	21	1.8	(.71)	18		
11. Goal Setting	1.6	(.92)	21	1.8	(1.00)	18		
12. Total for Amount	30.5	(3.78)	21	31.7	(4.80)	18	.76	.39
QUALITY								
1. Physical Involvement	3.7	(.77)	17	3.9	(.75)	17		
2. Verbal Involvement	3.8	(.51)	21	3.9	(.73)	18		
3. Responsiveness of Caregiver	3.8	(.75)	21	3.9	(.68)	18		
4. Play Interaction	3.8	(.70)	21	3.8	(.73)	18		
5. Teaching Behavior	3.8	(1.30)	5	3.8	(.50)	4		
6. Control Activities	3.8	(.77)	21	3.8	(.88)	17		
7. Directiveness, Demands	3.9	(.64)	20	3.6	(.79)	17		
8. Relationship Among Activities	3.3	(.85)	21	3.5	(.79)	18		
9. Positive Statements, Regard	3.7	(.46)	15	4.0	(.63)	16		
10. Negative Statements, Regard	3.8	(.83)	18	3.4	(.79)	12		
11. Goal Setting	3.9	(.60)	9	3.6	(.70)	10		
12. Total for Quality	32.7	(5.50)	21	32.4	(8.90)	18	.02	.89
APPROPRIATENESS								
1. Physical Involvement	4.1	(.43)	17	4.1	(1.2)	17		
2. Verbal Involvement	3.5	(.81)	21	3.7	(.58)	18		
3. Responsiveness of Caregiver	3.8	(.77)	21	3.6	(.62)	18		
4. Play Interaction	3.9	(.57)	21	3.9	(.83)	18		
5. Teaching Behavior	3.8	(.45)	5	4.0	(.82)	4		
6. Control Activities	3.6	(.75)	21	3.6	(.79)	17		
7. Directiveness, Demands	4.0	(.65)	20	3.9	(.56)	17		
8. Relationship Among Activities	3.3	(.72)	21	3.7	(.69)	18		
9. Positive Statements, Regard	4.3	(.59)	15	3.8	(.75)	16		
10. Negative Statements, Regard	3.8	(.73)	13	3.8	(.58)	12		
11. Goal Setting	4.0	(.71)	9	3.9	(.74)	10		
12. Total for Appropriateness	33.0	(5.40)	21	32.7	(8.80)	18	.03	.87
GENERAL IMPRESSION								
1. Availability	4.2	(.83)	21	4.4	(.71)	18	1.16	.29
2. Acceptance	4.1	(.70)	21	3.9	(.90)	18	.03	.86
3. Atmosphere	3.8	(.98)	21	3.6	(.70)	18	.04	.83
4. Enjoyment	3.5	(.68)	21	3.8	(.88)	18	1.70	.20
5. Learning Environment	3.4	(.93)	21	3.5	(.86)	18	.07	.79
AVERAGE RATINGS								
1. Amounts	2.8	(.34)	21	4.5	(6.9)	18	1.37	.25
2. Quality	3.7	(.52)	21	6.6	(11.9)	18	1.19	.28
3. Appropriateness	3.8	(.48)	20	4.9	(4.6)	18	1.16	.29
4. General Impression	3.8	(.67)	21	8.8	(21.3)	18	1.15	.29

Table 2.13

Year 1 Posttest Parent/Child Interaction Ratings by Mahoney for Alternative Intervention Groups for SMA/Lake McHenry

	Basic Intervention			Expanded Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
Affect	3.31	(.69)	31	3.24	(.56)	31	.71	-.09
Child Orientation	3.17	(.91)	31	2.85	(.76)	31	.16	-.36
Performance Orientation	2.99	(.75)	31	3.12	(.48)	31	.51	.17

be expected in programs of this type, this subgrouping was done to examine a more direct comparison of one versus three times-per-week services. In both cases, the results were not very dissimilar from those using the full groups. All child measures were found to favor the basic group with some subdomains and, in the case of the attendance subgroup analysis, the total Battelle score being statistically significantly in favor of the less intensive group. Although differences were found in child related stress as measured by the PSI, the effect size for the full group analysis is not very different, and this apparent effect is not seen as dramatically in years 2, 3, and 4 testing. Tables 2.14 to 2.17 show the results of the subgroup analyses.

Table 2.14

Year 1 Posttest Measures of Child Functioning for SMA/Lake-McHenry Project (Excluding Subjects with Mild Disabilities)

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$♦	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
Age in months at Posttest		24.8	(5.9)	---	21	24.1	(5.2)	---	16	.14	-.12	.71
Battelle Developmental^ Inventory Raw Scores for:												
Personal/Social	1,2,3,4	37.4	(18.5)	39.3	21	37.9	(14.4)	36.0	16	1.38	-.18	.25
Adaptive Behavior	1,2,3,4	28.0	(13.3)	29.6	21	29.9	(10.0)	28.3	16	.47	-.10	.50
Motor	1,2,3,4	40.6	(26.4)	43.1	21	36.3	(17.8)	33.7	16	4.39	-.36	.04
Communication	1,2,3,4	19.7	(8.9)	20.8	21	21.8	(7.4)	20.7	16	.00	-.01	.95
Cognitive	1,2,3,4	17.0	(10.0)	18.2	21	19.0	(6.3)	17.8	16	.11	-.04	.74
Total	1,2,3,4	142.8	(73.9)	151.1	21	144.8	(50.0)	136.5	16	2.55	-.20	.12

♦ 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Number of people living in the home

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.15

Year 1 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry (Excluding Subjects with Mild Disabilities)

		Basic Intervention				Expanded Intervention						
Variable	Covariates[♦]	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$[#]	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
● **Parenting Stress Index**[*]												
Child	1,2	123.5	(18.6)	123.0	21	112.4	(21.5)	112.9	16	3.36	.54	.08
Parent	3,9	131.8	(27.5)	128.9	21	126.6	(35.9)	129.4	16	.00	-.02	.95
Total	1,2	255.3	(36.5)	250.2	21	239.0	(50.9)	244.1	16	.26	.17	.62
● **Family Adaptation and**[**] **Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	4,6,7	21.0	(4.9)	21.6	21	23.8	(5.0)	23.2	16	.85	.33	.36
Cohesion	5,3,6,7	38.0	(6.8)	38.2	21	39.1	(5.4)	38.9	16	.12	.10	.74
● **Family Support Scale (FSS) - Mother**	9,3,6,7	27.3	(9.7)	27.7	21	29.2	(10.9)	28.9	16	.24	.12	.63

[♦] 1 = PSI Total (pretest), 2 = FILE (pretest), 3 = PSI Parent Related (pretest), 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Father living with child, 7 = Income, 8 = Family Support Scale (pretest)

[*] Lower scores on the Parent Stress Index are considered better.

[**] Raw scores for the FACES were used and higher scores are considered better.

Table 2.16

Year 1 Posttest Measures of Child Functioning for SMA/Lake-McHenry Project (Excluding Subjects with Low Attendance)

		Basic Intervention				Expanded Intervention						
Variable	Covariates[♦]	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	p Value
Age in months at Posttest		25.3	(6.0)	---	27	21.7	(5.6)	---	20	4.40	-.60	.04
Battelle Developmental[^] **Inventory Raw Scores for:**												
Personal/Social	1,2,3,4	57.3	(25.1)	49.9	27	43.2	(15.9)	44.6	20	4.01	-.21	.05
Adaptive Behavior	1,2,3,4	37.4	(16.0)	36.7	27	34.0	(9.5)	34.7	20	1.52	-.13	.23
Motor	1,2,3,4	55.4	(29.3)	54.8	27	44.2	(19.3)	44.8	20	6.17	-.34	.02
Communication	1,2,3,4	27.6	(13.1)	27.2	27	24.6	(7.2)	25.0	20	2.80	-.17	.10
Cognitive	1,2,3,4	23.0	(11.6)	23.0	27	21.4	(5.5)	21.8	20	.96	-.10	.33
Total	1,2,3,4	195.1	(92.8)	191.6	27	167.3	(51.9)	170.8	20	6.51	-.22	.02

[♦] 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Number of people living in the home

[^] Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.17

Year 1 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry (Excluding Subjects with Low Attendance)

		Basic Intervention				Expanded Intervention						
Variable	Covariates[♦]	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	p Value
• **Parenting Stress Index**[*]												
Child	2,3	120.0	(21.1)	119.1	27	108.3	(16.1)	109.7	20	4.46	.45	.04
Parent	2,7	129.1	(23.8)	126.4	27	127.8	(37.1)	131.4	20	.78	-.21	.38
Total	1,2	249.1	(38.2)	244.3	27	236.1	(47.4)	242.4	20	.04	.05	.84
• **Family Adaptation and**[**] **Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	4,6	23.2	(6.0)	23.2	27	23.3	(4.5)	22.7	20	.16	-.08	.69
Cohesion	5,6,7	39.3	(6.8)	39.8	27	38.9	(5.5)	38.1	20	1.21	-.25	.28
• **Family Support Scale (FSS) - Mother**	9,7,8	28.0	(10.0)	28.9	27	31.2	(10.2)	31.0	20	1.15	.21	.29

[♦] 1 = PSI Total (pretest), 2 = FILE (pretest), 3 = PSI Child Related (pretest), 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Maternal age, 7 = PSI Parent Related (pretest), 8 = Occupation of father, 9 = Family Support Scale (pretest)

[*] Lower scores on the Parent Stress Index are considered better.

[**] Raw scores for the FACES were used and higher scores are considered better.

Posttest Analyses for Year 2

For one subject in the expanded services group, the family declined to have the child complete the measures of child functioning, but did complete the family measures. The results of the analyses of the child functioning measures for Year 2 for all other subjects are contained in Table 2.18. Once again, all the effect sizes on the Battelle favored the basic group with two subdomains approaching statistical significance (p < .10.).

The results of the analyses of the Year 2 posttest measures of family functioning are contained in Table 2.19. There was a statistically significant difference between the groups for Mother's Family Support Scale Score for adequacy of support. This is consistent with the findings for Year One.

Table 2.18

Year 2 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	p Value
Average length of time between Posttests 1 and 2	---	12.9	(1.3)		28	12.6	(1.8)		21	.79	.13	.38
Age in months at Posttest 2	---	38.8	(6.4)		28	36.1	(6.7)		21	2.02	.43	.16
• **Battelle Developmental^ Inventory (BDI) raw scores for:**												
Personal/Social	1,2,3	78.0	(40.7)	79.3	28	74.4	(31.1)	73.1	20	1.79	-.15	.19
Adaptive Behavior	1,2,3	48.0	(25.2)	49.0	28	48.7	(18.4)	47.7	20	.26	-.05	.61
Motor	1,2,3	62.1	(38.2)	64.3	28	63.0	(26.4)	60.7	20	.50	-.09	.48
Communication	1,2,3	35.4	(23.2)	35.9	28	30.5	(16.8)	30.0	20	2.78	-.25	.10
Cognitive	1,2,3	28.5	(18.9)	28.8	28	24.8	(12.5)	24.5	20	2.62	-.23	.11
Total	1,2,3	252.0	(140.5)	257.3	28	241.4	(97.1)	236.0	20	2.28	-.15	.14
• **Scales of Independent Behavior:**												
Early Development Standard Score	3,4,5	54.1	(35.0)	53.8	27	53.6	(32.4)	53.8	20	.00	.00	.99

♦ 1 = Battelle total raw score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Battelle adaptive behavior raw score (pretest), 5 = Number of people living in the home

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.19

Year 2 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
• **Parenting Stress Index***												
Child	1,2	121.6	(23.8)	121.8	28	114.3	(26.3)	114.1	21	2.16	.32	.15
Parent	1,2	132.1	(26.8)	131.0	28	135.1	(40.2)	136.2	21	.52	-.19	.47
Total	1,2	253.7	(45.9)	252.8	28	249.4	(62.0)	250.3	21	.06	.05	.81
• **Family Adaptation and** Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	3	20.9	(4.9)	21.1	28	19.5	(6.2)	19.3	21	1.26	.37	.27
Cohesion	2,4,5,7	37.8	(6.4)	37.9	28	38.2	(6.4)	38.0	21	.00	-.02	.96
• **Family Support Scale (FSS) - Mother**	1,6	25.0	(9.1)	25.0	28	29.4	(10.7)	29.8	21	4.83	.53	.03
• **Comprehensive Evaluation of^ Family Functioning-Mother**												
Total Frequency	1,9	93.7	(27.9)	93.5	27	95.3	(19.8)	95.4	19	.16	-.07	.69
Total Problems	1,9	7.3	(7.9)	7.5	26	8.1	(9.6)	7.8	19	.03	-.04	.86
• **Comprehensive Evaluation of^ Family Functioning-Father**												
Total Frequency	1,9	91.4	(25.7)	93.1	18	96.1	(16.2)	94.4	16	.06	-.05	.81
Total Problems	1,9	6.4	(6.9)	6.7	18	7.7	(9.6)	7.3	15	.05	-.09	.82

♦ 1 = PSI Total (pretest), 2 = Maternal age, 3 = FACES Adaptability (pretest), 4 = FACES cohesion (pretest), 5 = Family resource scale (pretest), 6 = Family Support scale (pretest), 7 = PSI other related (pretest), 8 = Income, 9 = Battelle total raw score (pretest)

* Lower scores on the Parent Stress Index are considered better.

** Raw scores for the FACES were used and higher scores are considered better.

^ Lower scores for Total Problems are considered better, while high scores on total frequency are considered better.

Posttest Analyses for Year 3

There were no statistically significant differences between the groups on any measures of child functioning (Table 2.20) in favor of the expanded services group at Year 3. Once again, all effect sizes were negative with three subdomains of the Battelle; the total being statistically significantly in favor of the basic intervention group. On the measures of family functioning (Table 2.21), there was still a statistically significant difference on the Family Support Scale. There were no other statistically significant differences between the groups on any of the other family measures.

The data from the teacher questionnaire (Table 2.22) indicate that there are no statistically significant differences between the groups in terms of current educational placement on time spent in various types of classrooms. The data presented in this table indicate that the large majority of these subjects are currently receiving special education services through, or more hours per day, in a self-contained special education classroom.

Table 2.20

Year #3 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	ES	P Value
● Time Between Posttest #2 and #3		13.1	(2.0)	---	22	13.1	(1.7)	---	16	.00	.00	.98
● Age in Months at Posttest #3		53.1	(6.3)	---	22	49.4	(6.4)	---	16	3.16	-.59	.08
● Battelle Developmental Inventory^												
Raw Scores for:												
Personal/Social	1,2,3	98.4	(43.9)	99.2	22	81.3	(34.1)	80.6	16	6.11	-.42	.02
Adaptive Behavior	1,2,3	59.3	(27.8)	59.2	22	54.6	(19.9)	54.8	16	1.05	-.16	.31
Motor	1,2,3	82.5	(48.9)	81.9	22	78.2	(32.8)	78.8	16	.20	-.06	.66
Communication	1,2,3	49.8	(29.8)	49.3	22	34.3	(18.4)	34.8	16	6.84	-.49	.01
Cognitive	1,2,3	43.9	(27.2)	43.2	22	32.8	(15.4)	33.4	16	5.28	-.36	.03
Total Score	1,2,3	334.0	(170.6)	332.8	22	281.2	(113.6)	282.4	16	4.47	-.30	.04
● Child Behavior Checklist												
T-Score - Internalizing	---	54.7	(8.3)	---	22	54.6	(9.2)	---	15	.00	.01	.97
T-Score - Externalizing	---	48.5	(10.3)	---	22	51.9	(13.5)	---	15	.76	-.33	.39
T-Score - Total Problems	---	50.6	(10.3)	---	22	52.5	(11.3)	---	15	.28	-.18	.60

♦ 1 = Battelle total raw score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest).

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.21

Year #3 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates[♦]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	ES	p Value
● **Parenting Stress Index**[*]												
Child	1,2,3	114.0	(24.0)	117.1	22	115.4	(30.1)	112.9	16	.38	.18	.55
Parent	1,2,3	124.3	(24.2)	128.4	22	137.1	(44.2)	134.5	16	.62	-.25	.44
Total	1,2,3	238.3	(45.9)	238.8	22	253.2	(68.1)	252.5	16	.03	-.05	.85
● **FACES III - Mother**[**]												
Adaptability	2,4	21.9	(4.1)	22.1	22	21.5	(6.9)	21.1	16	.37	.24	.55
Cohesion	2,5	38.6	(7.4)	38.0	22	38.4	(6.0)	39.0	16	.27	-.14	.61
● **Family Support Scale-Mother**	1,6	25.3	(11.3)	24.9	22	30.2	(11.6)	30.7	16	3.90	.51	.06
● **Comprehensive Evaluation of**[^] **Family Functioning**-Mother												
Total Frequency	1	92.9	(17.6)	92.4	20	91.2	(26.3)	91.6	14	.02	.05	.90
Total Problems	1	5.3	(6.9)	5.0	20	6.9	(9.7)	7.1	14	.76	-.30	.39
● **Comprehensive Evaluation of**[^] **Family Functioning**-Father												
Total Frequency	1	94.4	(16.3)	95.2	15	98.1	(15.1)	97.3	14	.15	-.13	.70
Total Problems	1	5.6	(6.1)	5.9	15	4.9	(5.6)	4.6	14	.41	.21	.53

[♦] 1 = PSI total (pretest, 2 = FILE (pretest), 3 = Number of siblings receiving special education services, 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Family support scale (pretest)

[*] Lower scores on the Parent Stress Index are considered better.

[**] Raw scores for the FACES were used and higher scores are considered better.

[^] Lower scores for Total Problems are considered better, while high scores on total frequency are considered better.

Table 2.22

Year #3 Teacher Ratings and Parent Satisfaction Data for Alternative Intervention Groups for SMA/Lake McHenry

	Basic Intervention			Expanded Intervention					
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ANOVA F	p Value	ES
• Percentage of subjects currently in special education	90.0		20	100.0		15	1.25	.22	-.25
• Percentage with 90-100% Attendance[♦]	85.0		20	71.0		14	1.21	.24	.30
• Teacher's recommendation for[♦] placement for next year	1.9	(1.6)	18	1.6	(1.1)	15	.73	.47	-.19
• Teacher ratings for 15 items[♦]	36.1	(5.3)	20	37.9	(4.5)	15	1.16	.29	.34
• # of months child has attended current program	16.6	(7.8)	18	14.4	(9.5)	15	.51	.48	-.28
• # of Hours/Wk child attends current program	16.8	(9.9)	18	15.3	(7.9)	15	.24	.63	-.15
• % of time per week child spends in regular class	7.5	(24.5)	20	4.0	(15.5)	15	.24	.63	-.14
• % time per week child is in[*] self-contained class	82.4	(32.3)	20	92.4	(22.9)	14	.98	.33	.31

[♦] Higher scores for teacher recommendations indicate greater involvement in regular education program. Higher scores for teacher ratings indicate more desireable functioning.

[*] Lower percentage is considered better.

Posttest Analysis for Year 4

Results from Year 4 testing were taken from an incomplete sample as indicated before. Results, however, do not disagree with previous years' results. Again, all differences between groups favored the basic services group on child functioning (Table 2.23). This posttest, however, showed no statistically significant differences in any domain of the Battelle or its total. Statistically significant differences were found, however, on one subscale and the total score of the PSI (Table 2.24). This indicates that families of the expanded services group had lower overall stress and stress related to their daily lives unrelated to their child.

Table 2.23

Year #4 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates[♦]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	ES	p Value
Age in months at Posttest												
Battelle Developmental[^] Inventory Raw Scores for:												
Personal/Social	1,2,3,4,5,6	113.4	(45.3)	110.5	19	104.8	(41.2)	107.8	17	0.05	-.06	.82
Adaptive Behavior	1,2,3,4,5,6	70.5	(28.2)	68.5	19	64.3	(24.2)	66.3	17	0.10	-.08	.75
Motor	1,2,3,4,5,6	93.8	(48.7)	93.9	19	87.9	(36.8)	87.8	17	0.30	-.13	.59
Communication	1,2,3,4,5,6	60.3	(33.0)	59.3	19	48.6	(24.6)	49.5	17	1.49	-.30	.23
Cognitive	1,2,3,4,5,6	55.2	(32.9)	54.1	19	43.8	(23.9)	44.9	17	1.44	-.28	.24
Total	1,2,3,4,5,6	393.3	(182.2)	386.3	19	349.5	(142.5)	356.4	17	0.54	-.16	.47

[♦] 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Gender, 5 = FILE (pretest), 6 = Number of people living in the home.

[^] Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.24

Year #4 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates[♦]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	ES	p Value
● **Parenting Stress Index[*]**												
Child	1,2,3	110.5	(26.1)	114.7	15	105.0	(27.8)	100.8	15	2.49	.53	.13
Parent	1,2,3	123.9	(23.3)	130.3	15	122.7	(38.9)	116.3	15	3.70	.60	.07
Total	1,2,3	234.3	(44.8)	245.0	15	227.7	(62.9)	217.0	15	3.94	.63	.06
● **Family Adaptation and[**] Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	4,6	22.8	(5.0)	22.1	18	21.2	(5.6)	21.9	16	0.03	-.04	.88
Cohesion	2,5,6,7,8	40.2	(4.2)	39.0	17	39.4	(8.7)	40.6	16	0.73	.38	.40
● **Family Support Scale (FSS) - Mother**	2,9	30.6	(8.8)	28.9	18	29.4	(9.2)	31.0	16	0.46	.24	.50

[♦] 1 = PSI Total (pretest), 2 = FILE (pretest), 3 = Ethnicity of child (Caucasian/noncaucasian), 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Age of child at pretest, 7 = PSI other related (pretest), 8 = Family Resource Scale (pretest), 9 = Family support scale (pretest).

[*] Lower scores on the Parent Stress Index are considered better.

[**] Raw scores for the FACES were used and higher scores are considered better.

Conclusions

A few conclusions can be made about the relative effectiveness of once per week versus three times per week services given the longitudinal data presented for this population. First of all, it does not appear that increasing the number of service hours to three times a week has a significant effect on the skill development of a child with disabilities. Although there were three separate indices of the child's developmental level at Year 1, two indices at Year 2, and one at Years 3 and 4, there were no statistically significant differences between the once-per-week and three-times-per-week groups on any of these measures in favor the expanded services group.

In fact, all differences in child functioning, with the exception of the Wisconsin at Year 1, were in favor of the basic intervention group. This does not necessarily indicate that less intensive interventions are better, but with all the data suggesting that treatment was implemented as planned, and that groups remained comparable for all 4 posttest analyses, it is fairly certain that this small increase in service intensity failed to produce detectable benefits in terms of child functioning.

The only benefit for families is the perception that they are receiving better support, which is worthwhile, but does not seem worth an expenditure of approximately $6,500 per child per year. Even though the data from this study are clear, it should be noted that final decisions should not be made until other studies replicate these results. It is also important to note that this does not necessarily mean that more intensive interventions will not be more effective. There may well be a threshold which has not been achieved in this study. Perhaps instead of providing three hours of individualized intervention per week, 20 hours per week are necessary to achieve the types of benefits that would be measurable. Additionally, the hypothesis that the observed effects on parental support might generalize to more profound outcomes such as a maintenance of parental marital status and willingness of the family to continue to maintain the child in the home. The longitudinal data to be collected in future years will be crucial in addressing these issues.

ARKANSAS INTENSITY STUDY

Project #3

COMPARISON: Children with Mild to Severe Disabilities--Home-based intervention once per week versus home-based intervention twice per week.

LOCAL CONTACT PERSONS: Lowell Collins, Coordinator (Sunshine Preschool); Janice Hardin, Ed.D., Coordinator (Richardson Center)

EIRI COORDINATOR: Chuck Lowitzer

LOCATION: Bentonville, Arkansas, and Fayetteville, Arkansas

DATE OF REPORT: 11-12-1991

Rationale for the Study

Limited evidence in the existing literature is available to guide programming decisions concerning the relative effectiveness of various intensities of early intervention (White & Casto, 1985). The frequency and intensity with which early intervention services are provided varies across program models based largely on philosophical orientation and professional judgment of individual child needs. Although home-based early intervention models are widely used, there is little empirical evidence upon which to make decisions regarding the effects of varying the frequency of home-based services. This study provides a comparison of the effectiveness of two levels of intensity of home-based services for children from birth to five years old.

Review of Related Research

Currently, parents and professionals often make decisions regarding the form services should take based only on their experience and/or philosophy of the human condition (Fredericks, 1985). Rarely are the program models, approaches, or curricular contents evaluated in a systematic manner (Switsky & Haywood, 1985). The field lacks empirical findings in many areas critical to the training and education of young children with severe disabilities. The treatment intensity issue is of particular importance in programs serving young children with moderate and severe disabilities because it is often assumed that the developmental needs of such children warrant more intervention. Discussions about whether interventions should be more intensive also raise concerns about the costs associated with increased intervention.

Although research in this area is sparse (Bailey & Bricker, 1984), Casto and his colleagues have conducted a series of meta-analyses indicating that intensity of intervention may be an important variable for children with disabilities (Casto, 1987; Casto & Mastropieri, 1986). Specifically, Casto (1987) noted that intensity and duration appeared to be important considerations for programs serving preschoolers with disabilities, but less so for disadvantaged populations. When adjustments were made for age at start of intervention, quality of outcome measures, and time of measurement, the range of effect sizes was .45 to .88, in favor of more intense interventions (Casto, 1987). These effect sizes indicate that more intense (longer) intervention resulted in a performance difference ranging from almost one-half to more than three-quarters of a standard deviation on whatever measure of child progress was used. These encouraging findings, however, must be viewed with caution because many studies included in the analysis were confounded by the investigator's failure to distinguish intensity and duration of intervention and/or their failure to include other important variables in the analyses. Continuing literature searches by White and his colleagues (Innocenti, 1991; White, 1986; White & Casto, 1985) have found few studies that have systematically compared home-based intervention programs varying solely on the intensity of intervention. In fact, Innocenti (1991), in an exhaustive search, found only one study comparing two levels of home visit frequency with families of children with disabilities. A description of that study follows.

The study by Sandow and her colleagues is particularly important in light of the commonly held belief that "more is better" when it comes to early intervention for children with disabilities (Sandow & Clarke, 1978; Sandow, Clark, Cox, & Stewart, 1981). In a well-designed research project, a home-visit program conducted twice per month was compared to the same program provided once every two months (Sandow et al., 1981). The two service groups of 16 children (total of 32 children) were contrasted with each other and with a matched comparison group of 15 children who received no intervention. The children had a mean chronological age of two years six months and a mean mental age of one year three months at the start of the study. Differences in cognitive functioning were not statistically significant after one year; after two years differences favored the lower intensity group. After three years, there were again no statistically significant differences between groups, although the no service comparison group had only 2 children who had gained in IQ as compared to 6 in the more intense group and 5 in the less intense group. Sandow et al. concluded from their findings that less intervention may be preferred in that parents then tend to rely more on their own capabilities than on those of the interventionist(s). While this was a very well designed investigation, outcome data were collected only on children, leaving unknown the impact of intervention differences on families.

Only three other studies varying on home visit intensity were identified by Innocenti (1991), one of which is the present investigation and the other two of which included disadvantaged as opposed to disabled populations. A fourth study that was similar to a home visit program in terms of parent-interventionist contact (i.e. one one-hour visit per week versus three one-hour visits per week) also included children with disabilities, but parents took their children to a center for the visits. That study (McLinden, 1991) found no statistically significant differences between groups on child or family functioning after three years of follow-up. The two studies focusing on disadvantaged children (Burkett, 1982; Powell & Grantham-McGregor, 1989) were found to be of poor and fair methodological quality, respectively. The Burkett study included 138 children (69 per group) averaging 68 months of age who received visits either once per week or once every two weeks that involved training parents to perform learning activities with their children. After nine months of intervention, the group receiving more frequent visits scored an average of .22 standard deviation higher on the Preschool Inventory and the Peabody Picture Vocabulary Test (PPVT). Major weaknesses in this investigation were the use of home-visitors to administer the assessment instruments and the failure to specify methods for assignment to groups. The Powell and Grantham-McGregor study included 94 disadvantaged Jamaican children (49 of whom received home visits twice per month and 45 visited once per month). Visitors worked with parents on home teaching skills and improving parent-child interactions. After two years of intervention the group receiving more intense intervention scored an average of .57 standard deviations higher on the Griffiths Mental Scale and the PPVT. Although naive diagnosticians were included in this investigation, group assignment was based on neighborhood rather than a random assignment procedure. No measures of family functioning were used by either Powell and Grantham-McGregor or Burkett.

The research reported here represents an effort to fill a gap in the literature with respect to the optimal intensity of home-based services. This research enriches the existing data base and yields information helpful in determining the optimal frequency of home visits for young children with disabilities. The significance of the study is enhanced by the fact that it was conducted in a largely rural area in which home visitation is a common practice. It is an especially valuable addition to the literature in that it provides three to four years of follow-up data on the developmental status of the children.

The effects of varying the intensity of service were investigated within the framework of Family Systems Theory (Haley, 1976, 1980). The long-term (three to four years) impact of two intensity levels (once-per-week versus twice-per-week home visits) on both child and family outcomes was assessed. In a recent survey of over 600 providers of home-based intervention, Roberts and Wasik (1990) found that half made weekly home visits, 12% made visits every other week, and 22% used another schedule. Family systems theory, an extension of the interaction process approach, provided the conceptual framework from which to study the impact of early intervention on the families of children with disabilities. A variety of factors impacting the developing child are included in this framework, and several factors considered most important were evaluated in the present investigation. Specifically, family demographics, sources of support available to the family and child, family interaction style, and parental stress were measured. Attention was paid to differential effects of intervention intensity on children with varying levels of severity of disability. Parent involvement was also assessed because available data suggest that interventions requiring substantial parent time may actually increase stress and disrupt family functioning and because home-based delivery systems often require significant amounts of parent time (Turnbull, Summers, & Brotherson, 1983). Teaching quality and adherence to the research protocol was monitored. Finally, the study includes an analysis of the cost differences between the two levels of intensity, an area in which Barnett and his colleagues (Barnett, 1986; Barnett & Escobar, 1987) have noted a need for data from the economic perspective.

Overview of Study

Children and families participating in this study were randomly assigned to either the standard or the expanded home-based intervention group. Additional center-based services such as occupational, physical, and speech therapy were available to children in both groups and were provided with an intensity level approximately equal to the frequency of home-based services for each group. Expanded services were funded collaboratively (through the efforts of the service providers and EIRI) for the 1986-87 and 1987-88 academic years.

All children and parents completed a battery of tests that measured the child's developmental status, family demographics, parental stress, sources of support, and family adaptability and cohesion. Enrollment was conducted during two academic years (1986-87 and 1987-88), such that two cohorts of subjects were enrolled. The first cohort completed its fourth posttest in 1990, while the second cohort completed its third (see Table 3.1).

Methods

Program Organization

At the time this study was conducted, the Sunshine Preschool and Richardson Center were funded under the Arkansas Developmental Disabilities Council to serve individuals with disabilities not being assisted by the public schools due to either age or severity of disability. The elements of the programs related to this research were administered by on site coordinators who managed the research. The Sunshine program served children from birth to school-age, and the Richardson Center served persons from birth to adulthood; at the preschool level, both centers had home-based programs for children birth to three and center-based programs for children three to five. The Sunshine program also provided home-based services to children three to five when transportation to the center could not be arranged.

Table 3.1

Number of Children Tested by Test Date, Group, Cohort, and Site

	Pretest Year		Posttest Session			
	1986-1987	1987-1988	First 1987-1988	Second 1988-1989	Third 1989-1990	Fourth 1990-1991
COHORT #1						
Standard Service						
Sunshine	22	--	20	16	15	19
Richardson	5	--	4	4	3	3
Expanded Service						
Sunshine	24	--	23	20	21	21
Richardson	7	--	5	7	6	6
Total Sunshine	46		43	36	36	40
Total Richardson	12		9	11	9	9
Cohort # 1	58		52	47	45	49
COHORT #2						
Standard Service						
Sunshine	--	6	2	3	3	2-
Richardson	--	4	3	3	1	--
Expanded Service						
Sunshine	--	7	7	5	5	3
Richardson	--	3	3	3	2	3
Total Sunshine		13	9	8	8	45
Total Richardson		7	6	6	3	12
Cohort # 2		20	15	14	11	8

The Sunshine school consisted of two separate facilities that housed classrooms, offices, and a vocational program. Sunshine had a larger preschool staff and served a greater number of very young clients. Both Sunshine and Richardson Centers had a well-developed philosophy of service provision. Their main service goal for preschoolers was to develop functional, generalizable skills that enhanced development. Both centers transitioned some children into public school special education programs and continued to provide school-age services to the most severely disabled. The transition process is explained in the treatment verification section.

Prior to the initiation of the research, the Richardson Center program was entirely center-based, serving children on a schedule that was agreed upon by parents and center staff. Because of serious attendance problems, staff were not satisfied that the center-based delivery system was the most effective system available for serving these young children. They looked to the Sunshine Center as a model for home-based delivery. When the director of the Richardson Center decided to adopt a home-based model, she was invited to participate in the research. The staff at Richardson were then trained and evaluated by the Sunshine Preschool coordinator. Richardson had a staff of approximately 30 professionals and paraprofessionals. Two home-teachers, a speech therapist, and a physical therapist were involved in serving the children in the study.

With the help of staff at EIRI, funds were identified and obtained to enable the directors of both the Sunshine Preschool and the Richardson Center to offer twice-per-week home-based services on a short-term basis (two years) for a limited number of children. Without these funds, the standard level of once per week or once every other week would have been provided to all children.

Subjects

Subjects for this study were children from birth to four years of age at time of enrollment who were determined eligible for early intervention services according to Arkansas Developmental Disabilities Division standards. As explained below, children in the programs involved with this project qualified for participation on the basis of their age, type, and severity of disability. Parents of each child who met the study criteria signed an informed consent indicating that they were willing to participate in either the standard intensity or the expanded intensity conditions based upon a random assignment. Children were not enrolled in the study if over 48 months of age at the time of pretesting. This ensured that all participants were eligible to receive a minimum of one year of treatment before graduation to public school programs. The children were initially screened using the Developmental Profile II (Alpern, Boll, & Shearer, 1980). If they were functioning significantly below age level, further individualized assessments were administered. A child who could complete 75% of items at his/her age range was excluded from further evaluation. Three age levels (birth to 20 months; 21 to 36 months; and 36 to 48 months) and three levels of disability (severe [< 25% of age level]; moderate [25 to 50% of age level]; and mild [51 to 75% of age level on the Developmental Profile]) were included for stratification purposes.

Recruitment. All families with children receiving services prior to the 1986-87 academic year, and all new referrals during that year and the Fall of the 1987-88 year were approached by personnel from the Benton County Sunshine Preschool or the Richardson Center for possible participation in the study. Of those approached, all but 5 (2 at the Sunshine program and 3 at the Richardson Center) agreed to participate. This represents a 94% (78 of 83) rate of participation.

Assignment to groups. A total of 78 children who ranged in age from 3 to 48 months and had mild to severe developmental delays were randomly assigned to the two treatment conditions after stratification by chronological age and developmental functioning level (described above). A complete description of assignment procedures is provided in the 1987 Annual Report of the Early Intervention Effectiveness Institute.

Attrition. Sixty-seven children were posttested one year after pretest, 61 children were tested after two years, and 56 children after three years (see Table 3.1). Fifty-five children have completed fourth year posttesting. The number of children not participating at each posttest and the reasons for non-participation are presented in Table 3.2. Those children whose parents refused further participation had reached school age and were being assessed at school. The parents were concerned that their children were being tested too much, and the common sentiment was that testing would be aversive for their children. One family at the Richardson Center refused because they felt the family measures were too intrusive. A major cause of attrition at the Sunshine Preschool was difficulty in locating families at the time of posttesting. These were primarily families that moved frequently and did not have telephones. One child at each site was placed in foster care and was therefore dropped from the study.

Table 3.2

Reasons for Subject Attrition by Posttest

	Number of Subjects Lost*			
Reason	Posttest #1	Posttest #2	Posttest #3	Posttest #4
Parental Refusal	3	4	7	8
Discharged from EI services	1	1	1	1
Moved, not found**	2	6	6	4
Missed Appointments***	3	2	4	4
Deceased	1	2	2	2
In & Out of Foster Care	1	2	2	2
Total	11	17	22	21

* N at pretest was 78, with 58 in cohort 1 and 20 in Cohort 2. Cohort 2 has been posttested 3 times, and cohort 1 4 times.

** Three children missed the first posttest but not the second; four missed second but not third; and four missed third but not fourth.

*** Children in this category missed at least 3 appointments for assessment.

Analyses of data on participating and non-participating families indicate a few statistically significant group-by-status interactions (see Table 3.3). Of 39 tests done, 7 were statistically significant ($p < .10$) Three of these were at Posttest 3 and four at Posttest 4). Six of the seven revealed dropout patterns that would favor the more frequent intervention group if a bias were created. This type of bias

Table 3.3

Attrition Data for the Arkansas Intensity Study

								ANOVA					
		Low Intensity			High Intensity			Group		Study Status		Group by Status	
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p	F	p	F	p
POSTTEST #1													
CA at pretest	IN	27.5	(14.2)	29	29.1	(12.9)	38	.07	.79	.98	.32	.01	.93
	OUT	23.4	(15.1)	7	24.3	(4.9)	4						
BDI DQ	IN	45.1	(25.6)	29	54.8	(25.5)	38	1.29	.26	.42	.52	.00	.99
	OUT	50.6	(28.3)	7	60.4	(14.0)	4						
Total PSI	IN	248.3	(55.1)	28	255.6	(49.5)	35	.02	.90	.00	.99	.07	.79
	OUT	236.4	(45.8)	7	224.8	(43.4)	4						
FRS	IN	115.8	(25.5)	29	114.2	(20.5)	37	.25	.62	.00	.99	.07	.79
	OUT	117.9	(25.1)	7	112.0	(17.6)	4						
FSS	IN	29.4	(11.6)	29	29.3	(12.4)	38	.06	.80	.01	.91	.08	.78
	OUT	27.9	(7.2)	7	30.0	(14.7)	4						
Mother Education	IN	11.6	(2.1)	28	12.2	(2.2)	38	.55	.46	.04	.84	2.09	.15
	OUT	12.9	(2.6)	7	11.3	(1.0)	4						
Father Education	IN	11.7	(1.5)	27	12.1	(2.4)	37	.31	.58	.01	.94	1.15	.29
	OUT	12.5	(2.7)	6	11.3	3.8	4						
Income	IN	$15,339	($9,470)	28	$17,868	($10,842)	38	.00	.95	.07	.80	.64	.3
	OUT	$19,000	($10,731)	7	$16,000	($7,506)	4						
Number of Home	IN	29.14	(16.78)	29	68.53	(32.28)	38	12.58	.00	7.71	.01	1.09	.30
Visits	OUT	14.29	(8.40)	7	35.75	(19.02)	4						
Percent Home Visits	IN	84.25	(15.04)	29	82.29	(11.18)	38	1.48	.23	.00	.95	.57	.45
Attended	OUT	87.21	(11.60)	7	78.78	(7.13)	4						
POSTTEST #2													
CA at Pretest	IN	27.5	(15.2)	26	27.8	(11.3)	35	1.35	.25	.09	.76	1.21	.28
	OUT	24.6	(14.8)	10	33.0	(17.4)	7						
BDI DQ	IN	46.1	(25.4)	35	53.4	(24.8)	35	3.54	.06	.54	.47	.82	.37
	OUT	45.3	(28.4)	10	64.9	(22.6)	7						
Total PSI	IN	243.7	(53.1)	25	254.6	(45.1)	32	.00	.97	.02	.89	.47	.49
	OUT	251.4	(55.1)	10	242.4	(68.9)	7						
FRS	IN	115.5	(25.8)	26	113.6	(18.7)	35	.13	.72	.10	.76	.01	.94
	OUT	118.0	(24.1)	10	115.2	(28.9)	6						
FSS	IN	30.8	(11.0)	26	30.6	(13.1)	35	.09	.77	4.59	.04	.05	.82
	OUT	24.7	(9.5)	10	23.0	(5.9)	7						
Mother Education	IN	11.8	(2.1)	26	11.9	(1.8)	35	.67	.47	1.99	.16	.46	.50
	OUT	12.2	(2.6)	9	13.1	(3.3)	7						
Father Education	IN	11.9	(1.4)	26	12.2	(2.3)	34	.04	.85	.52	.47	.46	.50
	OUT	11.9	(2.7)	7	11.3	(3.6)	7						
Income	IN	$15,653	($9,756)	26	$17,057	($9,750)	35	.74	.39	.88	.35	.14	.71
	OUT	$17,278	($9,941)	9	$20,857	($14,232)	7						
Number of Home	IN	32.39	(15.40)	26	70.49	(32.63)	35	24.84	.00	14.94	.00	.38	.54
Visits	OUT	10.30	(4.08)	10	40.00	(17.81)	7						
Percent Home Visits	IN	83.79	(15.29)	26	81.96	(11.45)	35	1.10	.30	.28	.60	.28	.60
Attended	OUT	87.53	(11.74)	10	81.96	(7.79)	7						

(continued)

Table 3.3 (continued)

Attrition Data for the Arkansas Intensity Study

								ANOVA					
		Low Intensity			High Intensity			Group		Study Status		Group by Status	
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p	F	p	F	p
POSTTEST #3													
CA at pretest	IN	29.3	(15.3)	22	27.9	(12.5)	34	1.31	.26	.13	.72	2.47	.12
	OUT	22.6	(11.7)	14	32.0	(12.4)	8						
BDI DQ	IN	46.3	(26.3)	22	54.8	(26.2)	34	2.30	.13	.04	.84	.06	.81
	OUT	46.0	(26.0)	14	57.7	(17.2)	8						
Total PSI	IN	247.4	(50.8)	21	248.9	(47.6)	31	.78	.38	.25	.62	.60	.44
	OUT	243.6	(57.9)	14	266.9	(56.7	8						
FRS	IN	111.5	(26.7)	22	114.5	(20.2)	34	.69	.41	.46	.50	1.76	.19
	OUT	123.6	(21.0)	14	110.6	(20.5)	7						
FSS	IN	30.1	(11.5)	22	29.8	(12.9)	34	.00	.95	.62	.43	.00	.97
	OUT	27.6	(9.9)	14	27.5	(11.1)	8						
Mother Education	IN	11.3	(1.6)	22	12.1	(2.2)	34	.06	.81	1.00	.32	2.91	.09
	OUT	12.8	(2.8)	13	11.8	(1.9)	8						
Father Education	IN	11.5	(1.1)	22	12.3	(2.4)	33	.57	.45	.00	.98	4.91	.03
	OUT	12.7	(2.4)	11	11.0	(2.9)	8						
Income	IN	$13,227	($8,071)	22	$17,926	($10,985)	34	.01	.92	1.50	.22	2.89	.09
	OUT	$20,885	($10,570)	13	$16,668	($8,774)	8						
Number of Home Visits	IN	29.68	(16.86)	22	70.74	(33.12)	34	22.81	.00	7.80	.01	2.11	.15
	OUT	20.86	(15.11)	14	42.75	(17.95)	8						
Percent Home Visits Attended	IN	83.86	(15.78)	22	83.51	(8.19	34	3.04	.09	.75	.39	2.68	.11
	OUT	86.36	(12.11)	14	75.36	(17.66)	8						
POSTTEST #4													
CA at Pretest	IN	28.3	(15.4)	24	26.2	(11.0)	33						
	OUT	23.5	(11.7)	12	37.7	(15.4)	9	3.76	.08	1.00	.32	6.01	.02
BDI DQ	IN	48.2	(24.0)	24	55.9	(29.8)	33						
	OUT	42.1	(29.8)	12	56.6	(10.7)	9	2.63	.11	.11	.74	.35	.56
Total PSI	IN	253.4	(57.8)	23	249.8	(46.6)	31						
	OUT	231.4	(40.4)	12	265.5	(60.5)	8	1.19	.28	.04	.84	2.00	.16
FRS	IN	113.9	(25.9)	24	114.9	(20.8)	33	.74	.39	.02	.90	1.06	.31
	OUT	120.8	(23.5)	12	109.5	(17.3)	8						
FSS	IN	29.5	(12.4)	24	29.8	(12.6)	33	.00	.95	.30	.56	.02	.89
	OUT	28.5	(8.3)	12	27.7	(12.4)	9						
Mother Education	IN	11.3	(1.6)	24	12.5	(2.0)	33	1.59	.21	.01	.92	11.8	.00
	OUT	13.2	(2.8)	11	10.6	(2.3)	9						
Father Education	IN	11.5	(1.1)	23	12.3	(2.6)	32	.66	.42	.00	.99	5.39	.02
	OUT	12.8	(2.5)	12	11.0	(2.4)	9						
Income	IN	15312	(9145)	24	18242	(10783)	33	.03	.87	.00	.98	.87	.35
	OUT	17729	(11046)	11	15609	(9772)	9						
Number of Home Visits	IN	30.8	(17.5)	24	70.6	(31.6)	33	27.8	.00	8.40	.01	.66	.42
	OUT	17.2	(9.9)	12	46.3	(30.6)	9						

is of greatest concern if the final results show differences in favor of the more frequent intervention group since it would then be difficult to determine whether the differences were attributable to the intervention differences or to differential dropout. The fact that such differences did not appear at the end of the study makes attrition less of a threat. Furthermore, the fact that those variables that are most directly related to child development outcomes (BDI pretest scores) do not reveal group-by-status interaction makes us more confident that attrition, although it was substantial, did not have a biasing effect on the results that would invalidate their interpretation. Finally, most of those variables on which there were group-by-status interactions are only weakly correlated with outcomes in this study, which also reduces the threat of attrition as a confounding factor in interpreting the results.

Demographic characteristics. Pretest demographic data for subjects participating in each posttest to date are presented in Table 3.4. Families served lived in predominantly rural areas. The ethnic background of the subjects was predominantly Caucasian. Family incomes ranged from less than $5,000 to $39,999, with 28% falling into the low SES category (below $10,000). The average number of years of education for parents was between 11 and 12 years for both groups. Of the 68 tests conducted, 14 were statistically significant ($p < .10$). Of those most clearly related to intervention effectiveness (e.g. father's education, income, percent of children in daycare, percent of children with mother as primary caregiver), all favored the more frequent intervention group. However, the correlations between these variables and both child and family outcomes are quite low. If there is a bias in the groups at pretest, it would be in favor of the more frequent intervention group. Analysis of covariance procedures were used to adjust for these differences.

Table 3.4

Pretest Demographic Data for Subjects in the Arkansas Intensity Study

	POSTTEST #1								POSTTEST #2							
	Standard			Expanded					Standard			Expanded				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES
Child's age (in months)	27.5	(14.2)	29	29.1	(12.9)	38	.64	-.07	27.5	(14.2)	26	27.8	(11.3)	35	.95	-.13
Mother's age	32.5	(7.0)	27	32.4	(7.4)	38	.95	-.01	31.9	(7.0)	25	31.5	(7.0)	34	.81	-.06
Father's age	34.3	(7.6)	27	35.0	(8.4)	37	.74	.09	33.7	(7.9)	26	34.0	(8.0)	33	.87	.04
Mother's education	11.6	(2.1)	28	12.2	(2.2)	38	.34	.29	11.8	(2.1)	26	11.9	(1.8)	35	.87	.05
Father's education	11.7	(1.5)	27	12.1	(2.4)	37	.42	.27	11.9	(1.4)	26	12.2	(2.3)	34	.50	.21
Percent with both parents living at home	79.3		29	84.2		38	.62	.13	84.6		26	85.7		35	.91	.04
Hours per week mother employed	8.5	(16.0)	28	20.1	(21.4)	38	.01	.73	10.7	(17.3)	26	18.9	(18.8)	35	.08	.47
Hours per week father employed	33.6	(21.5)	27	39.5	(16.6)	37	.24	.27	36.5	(19.5)	26	39.3	(18.2)	34	.57	.14
Percent mothers who work outside of home	28.6		28	55.3		38	.02	-.51	30.8		26	57.1		35	.04	-.50
Percent fathers in technical/managerial positions	7.4		27	16.2		37	.28	.21	7.7		26	11.8		34	.60	.09
Total Household Income	$15,339	($9,470)	28	$17,868	($10,642)	38	.32	.27	$15,653	($9,756)	26	$17,057	($9,749)	35	.58	.14
Percent on public assistance	53.6		26	52.6		38	.94	.02	50.0		26	48.6		35	.91	.03
Mother as primary caregiver	62.8		29	81.6		38	.08	.42	84.6		26	80.0		35	.65	-.09
Percent in daycare > 5 hours per day	20.7		29	40.5		37	.15	-.39	23.1		26	42.7		35	.10	-.38
Number of siblings	1.5	(1.6)	28	1.2	(1.2)	38	.36	-.19	1.4	(1.3)	26	1.1	(1.1)	35	.40	-.23
Percent Male	62.1		29	63.2		38	.92	.02	61.5		26	57.1		35	.75	.08
Percent Caucasian	93.1		29	94.7		38	.74	.08	96.2		26	94.3		35	.88	.04

(continued)

Table 3.4 (continued)

Pretest Demographic Data for Subjects in the Arkansas Intensity Study

	POSTTEST #3								POSTTEST #4							
	Standard			Expanded					Standard			Expanded				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES
Child's age (in months)	29.3	(15.3)	22	27.9	(12.5)	34	.71	-.24	28.3	(15.4)	24	26.2	(11.0)	33	.56	-.14
Mother's age	32.7	(7.4)	21	31.8	(7.0)	34	.66	-.12	33.8	(7.0)	23	33.1	(6.9)	33	.72	-.10
Father's age	33.9	(7.9)	22	34.2	(8.1)	33	.87	.04	35.6	(7.3)	23	35.4	(8.1)	32	.93	-.03
Mother's education	11.3	(1.6)	22	12.1	(2.2)	34	.11	.50	11.3	(1.6)	24	12.5	(2.0)	33	.02	.75
Father's education	11.5	(1.1)	22	12.3	(2.4)	33	.08	.73	11.5	(1.1)	23	12.3	(2.4)	32	.08	.73
Percent with both parents living at home	86.4		22	85.3		34	.91	.00	83.3		24	84.9		33	.88	
Hours per week mother employed	9.9	(17.4)	22	18.3	(18.7)	34	.09	.48	9.9	(16.9)	24	17.2	(18.9)	33	.13	.43
Hours per week father employed	33.3	(22.2)	22	38.8	(17.4)	33	.34	.25	35.8	(20.7)	23	39.2	(17.8)	32	.53	.16
Percent mothers who work outside of home	27.3		22	55.9		34	.03	-.54	29.2		24	57.5		33	.09	
Percent fathers in technical/managerial positions	0		22	15.2		33	.13	.40	4.4		23	15.6		32	.16	
Total Household Income	$13,227	($8,070)	22	$17,926	($10,986)	34	.07	.58	$15,313	($9,145)	24	$18,242	($10,783)	33	.27	.32
Percent on public assistance	54.6		22	52.9		34	.91	.03	45.8		24	57.6		33	.39	
Mother as primary caregiver	86.4		22	82.4		34	.69	-.07	83.3		24	81.8		33	.88	
Percent in daycare > 5 hours per day	22.7		22	38.2		34	.22	-.29	20.8		24	36.4		33	.20	
Number of siblings	1.7	(1.7)	22	1.1	(1.2)	34	.21	-.35	1.7		24	1.1		33	.18	
Percent Male	68.2		22	61.8		34	.67	.11	58.3		24	57.6		33	.96	
Percent Caucasian	95.5		22	94.1		34	.99	.00	95.8		24	93.9		33	.75	

Intervention Programs

The expanded intervention was an extension of the standard service that was delivered prior to the initiation of the research. During the first year of the study, the intention was to provide services to the standard intensity group once every two weeks, and the expanded intensity group twice per week, resulting in a 1:4 intensity comparison. In response to requests from the service providers to deliver services that more accurately reflected their preferred service model, the targeted level of services for the standard intensity group was increased to once per week during the second year of the study. As a result, the intended comparison during the second year involved a 1:2 intensity difference. The actual number of home visits provided to each group per year of the study is presented in Table 3.5.

Table 3.5

Number of Home Visits by Study Year and Posttest Session

	Standard Intensity			Expanded Intensity				
Study Year	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	Ratio of Services	p Value
1986-87	11.1	(3.2)	24	34.6	(12.8)	28	3.13	.00
1987-88	29.0	(9.0)	21	52.7	(20.2)	31	1.82	.00
Both years (first post-test group)	29.0	(16.6)	29	68.5	(32.3)	38	2.36	.00
Both years (2nd post-test group)	32.2	(15.3)	25	69.7	(33.2)	36	2.16	.00
Both years (3rd post-test group)	29.5	(16.6)	22	70.8	(33.0)	34	2.40	.00
Both years (4th post-test group)	30.8	(17.5)	24	70.6	(31.6)	33	2.29	.00

* *N for the first year includes only children in the first cohort, and the N for the second year includes second cohort children plus those still receiving home visits during the second year of the study. Data are provided only for those years during which expanded services were available.*

Standard intervention group. The standard intensity group received home visits from trained paraprofessionals (mean rate of attendance was 87%). The preschool supervisor was responsible for training. As noted above, the intended frequency of home visits was once every other week during Year 1 and once per week during Year 2 of the study. The home teachers spent two weeks in individualized training, and were then closely supervised on their first home visits. Nine home teachers participated, two of whom had baccalaureate degrees, and all had extensive experience and background in early intervention.

Motor and speech/language therapists provided individual therapy on a weekly basis to children whose evaluation data indicated a therapy need. The children were brought to the center for their therapies that lasted approximately ½ hour. The home-based intervention took place primarily in the subject's home, although a small number of children were visited in daycare centers or at baby sitters.
Home teachers focused on working with the children directly. The parents were expected to observe and demonstrate to the home visitor what they had learned. Home visits lasted approximately one hour.

An Individual Education Plan (IEP) was developed for each child and was used to guide the home visitor in working with the child and parent(s) during the sessions. The content of home visits was taken from the IEP, which was based on recommendations made by the multidisciplinary assessment team (typically including a psychologist, speech/language pathologist, OT/PT, home visitor, and the child's parent). Goals and objectives for the child were agreed upon by the home visitor and the parent, considering the parent's needs and the child's progress over time. A variety of assessment instruments and curricula were used to develop the objectives in the IEP.

Intervention programs focusing on development of functional skills were provided by the home visitors and were individualized based on the child's developmental level and family's functioning. Typical goals included self-help (particularly feeding), gross motor, and communication skills. The primary care taker was required to demonstrate skill in positioning, feeding, and in 15 cases, medical technology such as oxygen, respirators, gavage feeding, and catheters. The home visitors were specially trained in these areas and helped parents meet the medical as well as developmental needs of their children. Children with less severe disabilities received programs focusing on their language, cognitive, self-help, and gross and fine motor needs.

Home visitors were assigned to children based on the children's level of functioning such that each visitor served approximately equal numbers of children in both groups. Three of the nine visitors had extensive experience with the severely disabled. The others had early childhood backgrounds as indicated in Table 3.6, which also indicates the number of children served by each visitor in each group. Each home visitor was observed at least two times annually by the EIRI staff coordinator and consistently demonstrated knowledge, creativity, and sensitivity in dealing with young children with disabilities and their families. It is important to note that all but two of the teachers had nearly equal numbers of children in both groups, thus reducing the possibility of group differences resulting from differences between service providers.

Home visits included the following activities: warm-up play period, discussion of current concerns and child's status, direct 1:1 programming designed to meet specific objectives, work with the parents, discussion of progress made towards specific objectives, work with the parents, discussion of progress made towards objectives, and data recording. When ending the visit, the home visitor reminded the parent of the next visit and of any scheduled therapies; left data sheets, program descriptions, detailed instructions, and materials for the parent to use;

and gave the parent encouragement for their efforts. Program data and anecdotal notes were recorded for each visit.

Table 3.6
Teacher Qualification and Original Assignments

Teacher	Education	Experience	# of Children in Standard	# of Children in Expanded
1	14 years	1 year	5	4
2	12 years	6 years	4	6
3	12 years	1 year	0	2
4	B.A.	2 years	7	6
5	M.A.	3 years	5	7
6	12 years	10 years	6	6
7	12+ years	1 year	4	5
8	12+ years	1 year	5	5
9	B.A.	2 years	0	1
TOTAL			***36***	***42***

The curriculum was based on comprehensive assessments and a modification of the Learning Accomplishment Profile. The home visitor brought a variety of materials and toys for programs and the child's folder for recording data. She worked individually with the child, keeping data on 4 to 6 goal areas. Every attempt was made to involve the parents in the activities. For example, the home visitor might demonstrate how to position a child for feeding and provide direct modeling, shaping, prompting, and positive reinforcement to the parent. Once the visitor had instructed the parent on how to carry out the activity, a schedule was set up for the parent to follow. The amount of time a parent was expected to spend with the child depended on the child's needs and the parent's willingness and ability.

Home visitors created data recording sheets for parents that included the following: (1) a specification of the activities to be conducted; (2) spaces to record data and duration of activity; and (3) spaces to record correct responses and errors, as well as progress made towards the objective. For example, in a feeding program, the key data recorded would be that the child consumed two ounces orally. In some cases, however, the only record made by parents was whether or not the activity took place or if the activity was successful.

Home visitors kept detailed data on number of trials, correct and error rates, and a specified description of what progress took place toward each objective addressed. Anecdotal records described the session, the parent and child response, and plans for the next session.

The IEPs were evaluated by the multidisciplinary team on a quarterly basis. All goals which had been achieved were recorded on a quarterly summary and shared with the multidisciplinary team. (During the site visit described below, 10% of the IEPs were randomly sampled for evaluation and were found to be age appropriate, developmental, and functional in nature.)

Expanded intensity group. The expanded intensity group received exactly the same type of service delivery (mean rate of attendance was 84%) as the low intensity group, but with at least double the frequency of home visits (see Table 3.5).

Treatment Verification

Intervention Implementation. A number of procedures were used to verify that the interventions for the two experimental groups were being implemented as intended.

The EIRI coordinator communicated on at least a weekly basis with the on site coordinator, assisted in areas of program development and child find efforts, and made periodic site visits. The site was visited three times during the 1987-1988 year by the EIRI site coordinator. Other program verification activities included the following:

1. ***Collection of attendance data.*** The child's participation in the program for both groups was recorded according to the length of the session and the staff involved. Non-attendance at regularly scheduled sessions was also recorded according to the reason for non-attendance. Table 3.5, discussed above, contains attendance data by group for the two years during which expanded services were available (1987-87 and 1987-88). Rates of attendance for home visits were nearly equal across groups. The data in Table 3.5 indicate that subjects received close approximations of the intended intervention frequency.

2. ***Data describing the level of parent involvement.*** Home teachers rated parents in three areas: attendance (in IEP meetings, therapy, home visits), knowledge regarding their child and their rights, and support activities (follow through, communication with staff, form completion, etc.). Parents were rated on each area with a 3-point scale, 1 = low, 2 = average, 3 = high. Table 3.7 contains the results of this teacher rating of parent involvement. Although none of the between group differences are statistically significant, the large effect sizes (Mean = .37) suggest that teachers rated parents in the expanded group as more involved than those in the standard group.

Table 3.7

Teacher Ratings of Parent Involvement* in the Home Visit Program

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
POSTTEST #1								
Attendance at visits and other activities	2.1	(.8)	29	2.3	(.7)	38	.24	.28
Knowledge/Understanding of child's program	1.9	(.9)	29	2.2	(.8)	38	.16	.33
Support of the child's program/activities	1.7	(.8)	29	2.1	(.8)	38	.05	.51
POSTTEST #2								
Attendance at visits and other activities	2.1	(.8)	26	2.2	(.7)	33	.62	.12
Knowledge/Understanding of child's program	2.0	(.8)	26	2.1	(.8)	33	.54	.16
Support of the child's program/activities	1.8	(.8)	26	2.0	(.8	33	.22	.34
POSTTEST #3								
Attendance at visits and other activities	2.0	(.8)	22	2.3	(.7)	33	.21	.33
Knowledge/Understanding of child's program	1.8	(.8)	22	2.2	(.8)	33	.10	.47
Support of the child's program/activities	1.6	(.8)	22	2.1	(.9)	33	.04	.61
POSTTEST #4								
Attendance at visits and other activities	2.0	(.8)	24	2.3	(.7)	33	.07	.41
Knowledge/Understanding of child's program	1.8	(.9)	24	2.2	(.7)	33	.03	.58
Support of the child's program/activities	1.6	(.8)	24	2.2	(.8)	33	.01	.79

*1 = Some involvement; 2 = Moderate Involvement; 3 = High Involvement

3. Teacher evaluations. The preschool supervisor evaluated teachers using two scales developed by EIRI staff. One was a 3-point scale (2 = criteria fully met; 1 = partially met; 0 = not met) that addressed five areas: teacher assessment skills, IEP development skills, IEP implementation skills, presentation of instruction, and instructional environment. The second assessed the following six teacher traits on a 5-point scale (5 = outstanding, 4 = very good, 3 = good, 2 = needs improvement, and 1 = inadequate): teaching skills, problem solving, work habits, relationships, communication skills, and attitude. Thus the minimum score was 6 and the maximum was 40. Actual teacher rating totals are presented in Table 3.8. Although there are some differences among teachers, the fact that teachers had children in each group means that these differences did not bias the results of the study.

Table 3.8

Teacher Evaluation Ratings

Teacher	1	2	3	4	5	6	7	8	9
Rating	21	34	24	29	40	30	40	40	32

4. ***Parent Satisfaction Data***. Parents completed a seven-item Satisfaction with Services Form to assess the degree to which parents in each group were satisfied with the services they received. Table 3.9 indicates that there were no statistically significant differences between groups in any of the areas addressed, but that three effect sizes greater than .30 were found. The expanded group tended to feel better in all areas except one, but both groups reported satisfaction in all areas. Additionally, there is a statistically significant correlation between parent satisfaction data and teacher ratings of parent involvement. This relationship is particularly strong between parent ratings of satisfaction with the opportunities they were given to participate in the development and conduct of their child's program. This suggests that the more parents are involved in their child's program, the more satisfied they are. The fact that satisfaction was measured on a 4-point scale and all means are above 3 suggests that parents in both groups were very satisfied.

5. ***Site Review***. Formal site reviews were conducted at the end of each treatment year as a part of a continuous effort to verify that treatment was taking place as planned. The EIRI Site Coordinator met with both Richardson and Sunshine Coordinators as well as with parents, ancillary staff, and all home teachers. In addition, the EIRI Site Coordinator attended a sample of home visits to observe each teacher at work.

Table 3.9

Parent Ratings of the Quality of the Home Visit Program*

	Less Intensive			More Intensive				
Study Year	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
POSTTEST #1								
Program Staff	3.82	(.39)	28	3.88	(.33)	34	.51	.15
Communication with staff	3.71	(.46)	28	3.59	(.61)	34	.36	-.26
Program Goals	3.54	(.58)	28	3.68	(.54)	34	.33	.24
Participation	3.54	(.69)	28	3.59	(.61)	34	.76	.07
Range of Services	3.36	(.62)	28	3.47	(.66)	34	.49	.18
Child Progress	3.10	(1.17)	28	3.44	(.89)	34	.22	.29
Overall	3.18	(1.20)	28	3.59	(.9)	34	.10	.34
POSTTEST #2								
Program Staff	3.80	(.41)	25	3.86	(.35)	29	.56	.15
Communication with staff	3.76	(.44)	25	3.52	(.63)	29	.10	-.55
Program Goals	3.56	(.58)	25	3.62	(.56)	29	.70	.01
Participation	3.56	(.71)	25	3.55	(.63)	29	.96	.01
Range of services	3.40	(.65)	25	3.41	(.68)	29	.94	.02
Child Progress	3.08	(1.22)	25	3.34	(.94)	29	.38	.21
Overall	3.16	(1.18)	25	3.51	(.74)	29	.20	.30
POSTTEST #3								
Program Staff	3.81	(.40)	21	3.86	(.35)	29	.63	.13
Communication with staff	3.71	(.46)	21	3.52	(.63)	29	.21	-.41
Program goals	3.52	(.60)	21	3.66	(.55)	29	.44	.23
Participation	3.52	(.68)	21	3.55	(.63)	29	.88	.04
Range of services	3.33	(.66)	21	3.41	(.68)	29	.68	.12
Child Progress	3.00	(1.30)	21	3.34	(.94)	29	.31	.26
Overall	3.24	(1.00)	21	3.59	(.73)	29	.18	.35
POSTTEST #4								
Program Staff	3.83	(.38)	24	3.86	(.36)	26	.34	.08
Communication with staff	3.75	(.44)	24	3.57	(.57)	26	.47	-.41
Program Goals	3.58	(.58)	24	3.68	(.55)	26	.36	.17
Participation	3.58	(.65)	24	3.68	(.55)	26	.24	.15
Range of services	3.33	(.64)	24	3.46	(.69)	26	.27	.20
Child Progress	3.08	(1.25)	24	3.32	(.95)	26	.41	.19
Overall	3.29	(.96)	24	3.50	(.75)	26	.32	.22

* Ratings ranged from 1 = Poor to 4 = Excellent.

> Results of the site reviews indicated that the project was well organized and implemented. The program files were in good order, containing up-to-date IEPs, quarterly reports of progress, assessment information, and description of services received. Randomly selected IEPs were reviewed, and all were found to contain the following: (1) a statement of current level of performance (both norm and criterion referenced); (2) annual goals and short-term objectives that were functional, appropriate, and individualized; (3) evaluation of criteria for determining when the objectives were met; and (4) timelines for monitoring.

Contextual variables. The possibility that other contextual variables could have biased the interpretation of outcome data was monitored throughout the project. Family demographic data (e.g. marital status, disruptive events in the family's life, family size, etc.), child health data, and access to additional therapeutic interventions were tracked using instruments developed at EIRI. The family demographic data contained in Table 3.4 indicate that pretest family structural differences remained stable among the posttest groups. Posttest data on a global measure of children's health and hours of therapy received from non-pre-school personnel indicate that children in both groups were perceived to be as healthy, on average, as their peers, and that the ratio in which other services were received was similar to the planned home visit intensity ratio.

Other intervening influences included family support and resources that were available and critical life events that occurred during the years of the investigation. The influences were assessed using parent rating scales developed for those purposes. These scales are described in the section on pretest measures and their impact is discussed in the results section.

Cost of alternative interventions. The cost of delivering the intervention programs described above was determined using the ingredient approach. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources.

In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are from the 1987-88 fiscal year (July to June) and are expressed in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, travel, materials and supplies, miscellaneous and contributed resources. Total costs in each resource category for both programs were first added together and then prorated according to program intensity: 60% of resources were consumed by the high-intensity program and 40% by the low-intensity program. Allocation is based on total number of child visits to the high-intensity program as contrasted with the total low-intensity child visits out of the total number of visits to both programs. Cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each group. Table 3.10 presents the cost per child in each of these resource categories.

Table 3.10

Cost Per Child for Sunshine School/Richardson Center

Resources	Expanded Intensity	Standard Intensity
1. **UNDISCOUNTED**		
Agency Personnel:		
Direct Service	$ 4,336	$2,169
Administrative	1,658	828
Facilities	561	281
Equipment	118	59
Materials/Supplies	244	121
Staff Transportation	395	198
Miscellaneous	807	403
Subtotal	$ 8,118	$4,059
Contributed Resources:		
Parent time	927	610
Parent Travel	332	166
Volunteer	32	16
Subtotal	$ 1,291	$ 792
TOTAL	$ 9,409	$4,851
2. **DISCOUNTED (3%)**		
Agency Resources	$ 8,871	$4,435
Total Resources	10,281	5,301
3. **DISCOUNTED (5%)**		
Agency Resources	$ 9,398	$4,699
Total Resources	10,892	5,616

Totals may not add up due to rounding errors

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to the program. Occupancy charges were based upon the replacement value of the facilities in which the programs were housed, annualized to account for interest and depreciation, and included all utilities, insurance, and maintenance costs. Equipment costs were based on the market replacement value of office furniture and equipment used by the program and also included equipment repair. Equipment cost, like facilities, was annualized to account for interest and depreciation. Staff transportation costs for home visits and other job-related travel were reimbursed by Sunshine Preschool and Richardson Center at the rate of $.23 per mile and $.22 per mile, respectively. The cost for materials and supplies and miscellaneous included the annual expense for all consumable items and miscellaneous expenses incurred by each program.

Contributed resources included the value of volunteer and parent time. Community members contributed 144 hours during the year to the programs. Parents in the high-intensity group spent an average of 58.1 hours in home visit sessions and an average of 33.89 hours in therapy sessions. Parents in the lower intensity group spent an average of 30.8 hours in home visits and 29.7 hours in therapy sessions. Parents were interviewed via telephone to determine the time and out-of-pocket expenses incurred getting their children to the center for therapy sessions. All parent and volunteer time in the program was assigned the opportunity cost of $9 per hour, and mileage was estimated at $.21 per mile.

Data Collection

Data concerning child and family functioning were collected at enrollment and annually thereafter. Testing procedures and results of each data collection effort are presented below.

Recruitment, training, and monitoring of diagnosticians. Three diagnosticians and a local assessment supervisor were trained and certified by EIRI standards. None were employed by either service provider, and testing assignments were made by the assessment supervisor to ensure that all diagnosticians were unaware of subjects' group placement. The diagnosticians possessed masters degrees in psychology, and the supervisor had a doctorate. The assessment supervisor was responsible for shadow scoring 10% of each diagnostician's test administrations, scheduling testing, and collecting, reviewing, and sending all protocols to the EIRI site coordinator.

Interrater reliability for the shadow scored BDIs were calculated by dividing the number of agreements by the total number of items administered. Reliability coefficients averaged .95 (range .80 to 1.00).

Testing. Parents of each child participating in the study signed an informed consent form and provided demographic information. Children were administered the Battelle Developmental Inventory, and parents completed the Parenting Stress Index (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES) as pretest measures. Parents were paid a $20 incentive at pretest, $30 at first posttest, and $50 at subsequent tests. The schedule for test administration is presented in Table 3.11. As explained later, data from pretest measures were used as covariates in the analyses as well as for investigating whether certain types of families or certain types of children benefitted more from intervention than others.

The FILE was considered to be a contextual variable, as indicated above. All other family scales were considered outcome variables. It was believed that intervention services would impact stress by helping families be more effective in dealing with their children with disabilities. Services were also believed to impact family adaptability and cohesion by teaching strategies for rearing children with disabilities that would facilitate changes in the patterns of interaction between spouses/mates and other children in the home. It was found that more cohesive families and those with more resources (as measured by the FRS) tended to report lower levels of stress. The FILE was considered a contextual variable because the events it records have both theoretical and data driven relationships with stress

Table 3.11

Description of Child and Family Measures and Schedule of Administration

MEASURES	DESCRIPTION	ADMINISTRATION Pretest	ADMINISTRATION Posttest
CHILD MEASURES			
Battelle Developmental Inventory (BDI) (Newborg et al., 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.	X	1 - 4
Sequenced Inventory of Communication Development (SICD) (Hedrick, Prather, & Tobin, 1984)	A measure of communication skills for children from birth to 48 months of age. Includes receptive and expressive communication domains.		1 - 3
The Vineland Adaptive Behavior Scales--Survey Edition (Sparrow, Balla, & Cicchetti (1984)	This version provides a general assessment of adaptive behavior, covering the domains of communication, daily living skills, socialization, and motor skills. It is administered to a parent or caregiver in a semistructured interview format. It is appropriate for use with persons ages birth to adult. Standard scores and age equivalents are obtainable. Norms for special populations (i.e., visually impaired) are also provided. Interrater reliabilities, internal consistencies, and concurrent validity data strongly support its use.		2 - 4
FAMILY MEASURES			
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .	X	1 - 4
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.	X	1 - 4
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.	X	1 - 4
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.	X	1 - 4
Family Adaptation and Cohesion Evaluation Scale -III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.	X	1 - 4

among families of children with disabilities. All of these relationships are discussed further in the results section.

Results and Discussion

Comparability of Groups on Pretest Measures

Pretest data from child and family measures appear in Table 3.12. No statistically significant pretest differences were found in any BDI domain, although the high intensity group performed at higher DQ levels in all domains. Family measures revealed some statistically significant pretest differences at each posttest session with regard to some demographic characteristics. Mothers' occupational status, hours per week mothers were employed, maternal education, and the percentage of children in daycare were all higher among the expanded group, although the statistical significance of the differences varied between posttest session (see Table 3.4). These differences were investigated in posttest analyses. It is worth noting that these differences existed even though subjects were randomly assigned to groups. Also, when interpreting the results of the outcome measures for this study, it is important to remember that if there is a pretreatment bias in the groups, in most cases its direction suggests improved performance among the expanded intervention group.

Measures of Child Functioning

Results of the four posttests are contained in Table 3.13. All posttest data were analyzed using Analysis of Covariance (ANCOVA) procedures. These procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which ANCOVA is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgement of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates are indicated in the table.

Table 3.12

Pretest Data for Children and Families in the Arkansas Intensity Study

	POSTTEST #1										POSTTEST #2									
	Standard				Expanded						Standard				Expanded					
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	P Value	ES	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	P Value	ES
Battelle Developmental Inventory (BDI)																				
Personal/Social	45.1	(24.8)		29	53.3	(23.7)		38	.18	.33	46.2	(24.4)		26	51.5	(24.4)		35	.38	.22
Adaptive Behavior	33.5	(20.2)		29	40.1	(17.4)		38	.16	.33	34.8	(20.6)		26	38.3	(15.7)		35	.47	.17
Motor	45.2	(35.4)		29	54.6	(28.4)		38	.25	.27	44.9	(35.3)		26	50.9	(26.6)		35	.47	.17
Communication	22.4	(16.3)		29	26.7	(13.2)		38	.29	.26	23.1	(16.1)		26	25.1	(12.4)		35	.61	.12
Cognitive	19.2	(13.8)		29	22.2	(9.2)		38	.32	.22	19.2	(13.6)		26	21.5	(9.1)		35	.45	.17
TOTAL	165.2	(106.4)		29	196.4	(87.5)		38	.20	.29	168.2	(106.4)		26	187.4	(80.6)		35	.44	.18
Parent Stress Index (PSI)																				
Child Related	121.3	(27.8)	89	28	120.4	(23.8)	88	35	.89	.03	118.8	(28.2)	87	25	120.0	(22.2)	88	32	.86	-.04
Other Related	127.0	(32.3)	61	28	135.2	(30.5)	73	35	.31	-.25	124.9	(30.3)	58	25	134.6	(28.7)	73	32	.23	-.32
TOTAL	248.3	(55.1)	78	28	255.6	(49.5)	84	35	.59	-.13	243.7	(53.1)	75	25	254.8	(45.1)	83	32	.42	-.21
Family Adaptation and Cohesion Evaluation Scales (FACES)																				
Adaptation	23.3	(7.3)		29	21.8	(5.4)		36	.35	-.21	23.9	(7.4)		26	21.6	(5.5)		36	.95	-.31
Cohesion	39.7	(7.0)		29	39.1	(5.3)		36	.71	-.09	40.4	(7.1)		26	39.2	(5.5)		33	.19	.17
Family Resource Scale (FRS)	115.8	(25.5)	46	29	114.0	(20.5)	41	37	.76	-.07	115.5	(25.6)	46	26	113.6	(16.7)	41	35	.75	-.07
Family Support Scale (FSS)	29.4	(11.6)	54	29	29.3	(12.4)	54	36	.96	-.01	30.8	(10.9)	63	26	30.6	(13.1)	63	35	.94	-.02
Family Inventory of Life Events (FILE)	8.7	(4.9)	47	29	12.2	(8.4)	29	36	.04	-.71	8.7	(5.3)	47	25	11.8	(7.4)	29	33	.07	-.58

* Statistical analysis for BDI scores were conducted using raw scores only.

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

◆ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

(continued)

Table 3.12 (continued)

Pretest Data for Children and Families in the Arkansas Intensity Study

	POSTTEST #3										POSTTEST #4									
	Standard				Expanded						Standard				Expanded					
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	P Value	ES	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	P Value	ES
Battelle Developmental Inventory (BDI)																				
Personal/Social	47.6	(26.4)		22	52.2	(23.8)		34	.51	.17	46.1	(26.1)		24	49.8	(23.2)		33	.58	.14
Adaptive Behavior	35.7	(22.3)		22	39.0	(17.2)		34	.55	.15	35.6	(21.1)		24	37.2	(16.5)		33	.76	.08
Motor	50.0	(37.9)		22	51.6	(28.3)		34	.86	.04	50.8	(35.9)		24	48.8	(26.8)		33	.82	-.06
Communication	24.8	(17.7)		22	25.1	(12.7)		34	.96	.02	23.1	(17.3)		24	23.9	(12.5)		33	.84	.05
Cognitive	20.5	(15.0)		22	21.6	(9.1)		34	.77	.07	20.6	(14.3)		24	20.5	(8.8)		33	.99	-.01
TOTAL	178.6	(116.0)		22	189.4	(86.7)		34	.71	.09	176.1	(111.0)		24	180.2	(83.5)		33	.88	.04
Parent Stress Index (PSI)																				
Child Related	122.6	(27.7)	92	21	116.4	(22.8)	85	31	.40	.22	124.7	(29.3)	92	23	117.4	(23.7)	86	31	.33	.25
Other Related	124.8	(28.0)	58	21	132.5	(29.8)	71	31	.35	-.28	128.7	(32.8)	65	23	131.6	(28.5)	70	31	.73	-.09
TOTAL	247.4	(50.8)	77	21	248.9	(47.6)	79	31	.92	-.03	253.4	(57.8)	82	23	249.0	(46.6)	79	31	.77	.08
Family Adaptation and Cohesion Evaluation Scales (FACES)																				
Adaptation	22.5	(6.3)		22	21.7	(5.5)		32	.59	-.22	23.6	(7.9)		24	21.3	(5.4)		31	.23	-.29
Cohesion	38.7	(7.5)		22	39.2	(5.5)		32	.78	-.11	39.2	(7.5)		24	39.5	(5.6)		31	.88	.04
Family Resource Scale (FRS)	111.5	(26.7)	39	22	114.5	(20.2)	43	34	.66	.11	113.9	(25.9)	41	24	114.9	(20.8)	43	33	.88	.04
Family Support Scale (FSS)	30.1	(11.5)	57	22	29.8	(12.9)	57	34	.92	-.03	29.5	(12.0)	54	24	29.8	(12.6)	57	33	.93	.03
Family Inventory of Life Events (FILE)	9.0	(5.4)	47	21	11.3	(7.6)	34	32	.21	-.43	9.1	(5.2)		24	11.5	(7.3)		31	.11	-.46

* Statistical analysis for BDI scores were conducted using raw scores only.

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

• Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

♠ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

# No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

Battelle pretest data (in each domain) were the best predictors of Battelle posttest scores, with correlations ranging between .67 and .96 ($p < .001$). Regression analyses indicated that when BDI total raw score was used as a correlate of child functioning measures, other variables, including family data, did not account for a statistically significant additional amount of variance in outcome measures. When the pretest demographic measures that were statistically significantly different (see Table 3.4) were included, missing data caused some cases to be dropped. The changes in posttest scores resulting from their inclusion were so small that it was decided to not use them as covariates. Although maternal education accounted for a difference found in the communication domain at first posttest, it was not included as a covariate in BDI analyses because its inclusion had little impact on results. Thus, pretest BDI Total raw score was used as a covariate in the ANCOVAs, with treatment groups (expanded intensity vs. standard intensity) as the independent variable and posttest Battelle raw scores as dependent variables. No statistically significant mean differences were found on any of the child measures at any of the posttests except that the standard intensity group outperformed the expanded group in the cognitive domain at first posttest (see Table 3.13). Although some fairly strong positive effect sizes were found in two BDI subdomains and one Vineland subdomain at third posttest, these differences disappeared at fourth posttest, suggesting that they may be random variations.

Measures of Family Functioning

Posttest analyses of family functioning measures are presented in Table 3.14. Pretest scores on outcome variables and posttest scores on intervening variables indicated in the tables were included as covariates for posttest scores. Covariates are listed in the order in which they entered the stepwise regression equation used in the process of identifying covariates. The use of data on contextual variables is a way of accounting for differences in perceived support and critical life events

Table 3.13

Posttest Measures of Child Functioning for Alternative Intervention Groups for Arkansas

		Standard Intensity				Expanded Intensity						
Variables	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	P Value	ES^
Posttest #1 (CA in months)		35.6	(14.2)		29	35.5	(12.3)		38	.09	.97	.01
Battelle Developmental Inventory*												
(BDI) Raw Scores for:												
Personal-Social	1	56.8	(34.8)	61.1	29	62.9	(26.3)	58.6	38	.46	.50	-.07
Adaptive Behavior	1	41.9	(25.9)	45.1	29	45.6	(18.0)	42.4	38	1.56	.22	-.10
Motor	1	57.7	(20.6)	62.6	29	66.5	(29.7)	61.5	38	.09	.76	-.03
Communication	1	27.5	(20.6)	29.8	29	33.2	(12.5)	30.9	38	.29	.59	.05
Cognitive	1	25.2	(17.6)	27.2	29	25.7	(11.4)	23.7	38	3.13	.08	-.20
TOTAL	1	209.1	(131.8)	225.8	29	233.9	(91.6)	217.2	38	.73	.40	-.07
SICD Age Discrepancies												
Receptive Communication	1	-14.6	(10.2)	-13.4	28	-12.7	(10.7)	-13.9	38	.12	.79	-.05
Expressive Communication	1	-17.0	(9.6)	-15.8	28	-15.0	(12.5)	-16.2	38	.15	.85	-.04
Vineland DQs												
Communication Domain	1	49.7	(28.1)	52.6	24	57.4	(29.2)	54.5	31	.09	.77	.07
Daily Living Domain	1	55.2	(28.3)	58.2	24	59.6	(27.8)	56.5	31	.09	.76	-.06
Socialization Domain	1	49.9	(30.3)	52.7	24	57.6	(25.9)	54.8	31	.13	.72	.07
Posttest #2 (CA in months)		46.7	(15.0)		26	44.9	(11.6)		35	.74	.58	-.12
Battelle Developmental Inventory*												
(BDI) Raw Scores for:												
Personal-Social	1	75.2	(42.6)	78.2	26	84.5	(35.7)	81.4	35	.21	.65	.05
Adaptive Behavior	1	50.4	(28.1)	52.8	26	53.5	(21.8)	51.1	35	.43	.51	-.06
Motor	1	68.8	(45.6)	72.3	26	74.1	(33.0)	70.6	35	.12	.72	-.04
Communication	1	35.8	(23.8)	37.7	26	40.3	(19.1)	38.4	35	.06	.81	.02
Cognitive	1	29.8	(20.7)	31.4	26	31.8	(14.9)	30.2	35	.36	.55	-.06
TOTAL	1	260.1	(152.6)	272.9	26	284.2	(116.2)	271.4	35	.01	.91	-.01
SICD Age Discrepancies												
Receptive Communication	1	-19.1	(13.7)	-18.7	24	-15.7	(14.6)	-16.1	30	.47	.50	.19
Expressive Communication	1	-23.0	(13.6)	-22.7	24	-13.7	(18.8)	-14.1	30	3.62	.06	.29
Vineland DQs												
Communication Domain	1	48.9	(29.1)	50.8	24	55.8	(26.6)	54.0	31	.31	.58	.11
Daily Living Domain	1	55.0	(33.8)	56.9	24	60.4	(26.0)	58.4	31	.06	.81	-.04
Socialization Domain	1	49.7	(27.5)	51.1	24	55.6	(23.3)	54.3	31	.29	.59	.12
Posttest #3 (CA in months)		60.6	(15.1)		22	57.4	(13.0)		34	1.35	.43	.21
Battelle Developmental Inventory*												
(BDI) Raw Scores for:												
Personal-Social	1	88.0	(51.4)	89.8	22	100.4	(40.3)	98.5	34	1.23	.27	.17
Adaptive Behavior	1	56.5	(32.7)	57.8	22	64.9	(25.1)	63.5	34	1.91	.12	.17
Motor	1	77.7	(52.1)	79.9	22	87.1	(39.6)	84.9	34	.72	.40	.10
Communication	1	44.8	(29.4)	46.0	22	47.3	(24.9)	47.1	34	.08	.78	.04
Cognitive	1	41.8	(32.0)	43.1	22	41.9	(24.7)	40.6	34	.38	.54	-.09
TOTAL	1	309.3	(191.2)	317.1	22	342.6	(145.2)	334.8	34	.64	.43	.09
SICD Age Discrepancies												
Receptive Communication	1	-27.4	(19.5)	-30.9	21	-24.0	(19.7)	-28.5	34	.28	.60	.12
Expressive Communication	1	-32.2	(15.6)	-31.9	21	-27.2	(19.3)	-27.4	34	.86	.36	.29
Vineland DQs												
Communication Domain	1	47.4	(27.4)	50.9	22	55.6	(30.3)	52.2	34	.62	.81	.05
Daily Living Domain	1	50.7	(27.0)	54.2	22	58.1	(29.0)	54.6	34	.01	.93	.01
Socialization Domain	1	47.1	(27.5)	50.5	22	55.1	(29.3)	51.8	34	.05	.82	.05
Posttest #4 (CA in months)		70.9	(16.2)		22	67.3	(13.2)		33	.92	.40	.22
Battelle Developmental Inventory*												
(BDI) Raw Scores for:												
Personal-Social	1	103.5	(47.1)	104.1	24	109.9	(41.2)	109.2	33	.38	.54	.11
Adaptive Behavior	1	66.8	(29.6)	67.2	24	67.7	(24.9)	67.2	33	.00	.99	.00
Motor	1	91.8	(51.4)	92.6	24	92.4	(40.2)	91.6	33	.02	.89	-.02
Communication	1	51.5	(30.5)	52.0	24	55.8	(26.9)	55.3	33	.48	.49	.10
Cognitive	1	49.7	(33.8)	50.2	24	48.8	(27.5)	48.3	33	.18	.67	-.06
TOTAL	1	359.1	(188.0)	362.1	24	374.5	(149.6)	371.1	33	.14	.71	.05
Vineland DQs												
Communication Domain	1	49.7	(28.1)	50.0	24	56.6	(29.6)	56.3	33	.88	.35	.22
Daily Living Domain	1	55.2	(28.3)	55.5	24	58.3	(29.2)	58.2	33	.17	.69	.10
Socialization Domain	1	49.9	(30.3)	50.2	24	56.5	(26.5)	56.2	33	.83	.37	.20

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* Statistical analysis for BDI scores were conducted using raw scores only.

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

♦ Covariate: 1 = Pretest BDI Total Raw Score

Table 3.14

Posttest Measures of Family Functioning for Alternative Intervention Groups for Arkansas Intensity Study

		Standard Intensity					Expanded Intensity							
Variable	Covariate[♦]	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	P Value	ES[^]
POSTTEST #1														
Parent Stress Index (PSI)[*]														
Child Related	1,2,3	116.7	(26.6)	117.4	86	26	116.2	(22.4)	115.5	82	31	.15	.71	.07
Other Related	1,2,3	129.0	(30.9)	131.4	68	26	134.5	(28.2)	132.2	68	31	.03	.86	-.03
TOTAL	1,2,3	245.7	(53.5)	248.7	79	26	250.7	(43.9)	247.7	78	31	.02	.89	.02
Family Adaptation and Cohesion Evaluation Scale (FACES)[♠]														
Adaptability (range 20 to 50)	4	21.8	(6.1)	21.4		29	21.4	(5.3)	21.8		36	.13	.72	.07
Cohesion (range 20 to 50)	5,2	38.9	(7.3)	38.7		29	40.0	(5.0)	40.2		35	1.76	.19	.21
Family Resource Scale[♠#] **(FRS)**	2	113.0	(23.0)	112.8	40	28	115.5	(20.5)	115.7	48	37	.84	.36	.13
Family Support Scale[♠#] **(FSS)**	6	29.5	(14.1)	29.5	57	28	28.0	(13.8)	28.1	50	37	.29	.60	-.10
Family Index of Life Events (FILE)	7,2	7.8	(6.1)	8.9	47	28	11.3	(6.6)	10.3	40	34	1.36	.25	.28
POSTTEST #2														
Parent Stress Index (PSI)[*]														
Child Related	1,2,3	113.3	(28.6)	114.4	80	24	117.2	(27.2)	116.0	85	29	.07	.63	-.06
Other Related	1,2,3	124.6	(31.9)	126.2	60	24	137.1	(25.9)	135.5	73	29	3.00	.09	-.28
TOTAL	1,2,3	234.5	(53.7)	237.0	68	24	258.1	(47.1)	255.6	84	29	3.64	.06	-.35
Family Adaptation and Cohesion Evaluation Scale (FACES)[♠]														
Adaptability (range 20 to 50)	4	20.7	(6.4)	20.4		26	22.2	(6.7)	22.4		33	1.41	.24	.25
Cohesion (range 20 to 50)	5,2	38.1	(7.9)	37.8		26	38.2	(6.2)	38.6		33	.33	.57	.05
Family Resource Scale[♠#] **(FRS)**	12	114.2	(26.8)	114.8	43	25	114.8	(16.0)	114.1	41	29	.03	.86	-.03
Family Support Scale[♠#] **(FSS)**	13	35.1	(15.7)	35.0	72	25	27.3	(11.1)	27.4	47	32	6.41	.01	-.48
Family Index of Life Events (FILE)	14,12	8.1	(7.2)	9.5	40	24	9.9	(7.7)	8.6	47	30	.41	.53	-.13

(continued)

[^] Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[*] Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[♠] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

[♦] Covariates: 1 = PSI Total (pretest);2 FRS total (pretest); 3 = FILE (posttest); 4 = FACES Adaptability (pretest); 5 = FACES Cohesion (pretest); 6 = FSS (pretest); 7 = FILE (pretest).

Table 3.14 (continued)

Posttest Measures of Family Functioning for Alternative Intervention Groups for Arkansas Intensity Study

		Standard Intensity					Expanded Intensity							
Variable	Covariate♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	P Value	ES^
POSTTEST #3														
Parent Stress Index (PSI)*														
Child Related	1,2,3	111.4	(26.7)	113.0	79	20	121.1	(29.0)	119.4	87	26	1.10	.30	-.24
Other Related	1,2,3	118.2	(26.5)	121.2	50	20	139.6	(32.9)	136.6	75	26	5.90	.02	-.58
TOTAL	1,2,3	228.8	(51.2)	233.2	65	20	256.8	(58.3)	252.5	82	26	3.04	.09	-.39
Family Adaptation and♦ Cohesion Evaluation Scale (FACES)														
Adaptability (range 20 to 50)	4	19.9	(5.2)	19.7		22	21.0	(6.0)	21.2		32	1.19	.28	.29
Cohesion (range 20 to 50)	5,2	38.5	(6.7)	38.7		22	38.4	(5.8)	38.1		32	.14	.71	-.09
Family Resource Scale♦# (FRS)	2	119.7	(24.3)	120.4	54	22	115.1	(17.6)	114.4	41	34	1.55	.22	-.25
Family Support Scale♦# (FSS)	6	29.5	(14.4)	29.4	54	21	27.9	(12.2)	28.0	50	34	.20	.66	-.10
Family Index of Life Events (FILE)	7,2	7.2	(4.9)	7.9	55	19	10.3	(8.1)	9.7	40	32	1.08	.30	-.39
POSTTEST #4														
Parent Stress Index (PSI)*														
Child Related	1,2,3	107.9	(20.8)	106.8	71	19	119.5	(30.9)	120.6	89	22	4.49	.04	-.66
Other Related	1,2,3	117.7	(33.9)	120.7	50	19	132.8	(33.5)	129.8	66	22	1.42	.24	-.27
TOTAL	1,2,3	226.1	(59.7)	228.1	60	19	252.9	(58.1)	250.9	81	22	3.74	.06	-.38
Family Adaptation and♦ Cohesion Evaluation Scale (FACES)														
Adaptability (range 20 to 50)	4	22.2	(8.5)	21.5		22	20.9	(5.4)	21.6		25	.00	.98	.01
Cohesion (range 20 to 50)	5,2	38.3	(9.0)	38.5		22	40.8	(5.1)	40.6		25	1.16	.29	.23
Family Resource Scale♦# (FRS)	2	120.6	(20.6)	120.8	55	24	114.8	(23.6)	114.6	43	33	1.26	.27	-.31
Family Support Scale♦# (FSS)	6	32.2	(15.6)	32.3	66	23	28.7	(13.9)	28.6	54	27	1.03	.32	-.11
Family Index of Life Events (FILE)	7,2	6.2	(4.5)	6.3		21	9.0	(5.4)	8.9		30	3.59	.06	-.58

(continued)

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

♦ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

# No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

♦ Covariates: 1 = PSI Total (pretest);2 FRS total (pretest); 3 = FILE (posttest); 4 = FACES Adaptability (pretest); 5 = FACES Cohesion (pretest); 6 = FSS (pretest); 7 = FILE (pretest).

that theoretically impact perceived stress. Our data to date support that theoretical relationship. Data on contextual variables are included in Tables 3.11 (pretest FACES cohesion and FRS) and 3.14 (posttest FILE) with unadjusted and adjusted means. Adjusted means were obtained by covarying on pretest data, as indicated in the table.

The data indicate some PSI differences are statistically significant (i.e., other related stress at third posttest, and all PSI domains at fourth posttest). Covariates used in these analyses included total stress scores, family cohesion scores, and total family resource scores at pretest, and critical life events (FILE) at posttest. The use of pretest stress, cohesion, and resource data was based on the relationship between these variables and posttest stress. Stress at pretest was highly positively correlated with posttest stress, while cohesion and resources were negatively correlated with stress. Cohesion and resources could have been effected by intervention, so use of pretest data accounts for differences on these variables that existed prior to intervention. The relationship between cohesion, resources, and stress was explored in depth, and is reported below.

Subgroup Analyses

Subgroup analyses concerning mother's years of education, children's health status, children's level of functioning, and teacher ratings of parent involvement have been conducted thus far. That is, children were divided into groups based on maternal completion or non-completion of high school, parental ratings of child health (as good as or worse than that of other children of the same age), mild and severe delay based on BDI DQ, and home visitor ratings of level of parental involvement. To assess the possibility of a severity of delay-by-intervention group interaction, children were grouped into severe and mild delay by a median split on pretest BDI DQ, and a group by severity level ANOVA was run. No significant interactions were found.

Only parent involvement has been found to produce large effects, as described below. The results of the parental education and child health data analyses suggest that the developmental progress of the children in this study was not affected by either their parent's assessment of the child's health status or by parental completion of high school. Parents were rated by their home visitor as "highly involved" if their total teacher rating score ranged from 7 to 9 and those rated as "less involved" if their total score was 6 or less. Differences found in analyses of DQ data between these groups are not statistically significant, but the effect sizes in three BDI domains (personal-social, communication, and cognition) were large at second third posttest (average .45) and medium at third and fourth posttest (averages .30 and .27, respectively), favoring highly involved parents. When analyses are conducted used raw scores, however, these effect sizes average only .27, .16, and .13 (Table 3.15).

These effect sizes, though suggesting that differences may exist, provide no clear direction as to cause and effect. It may be that parent involvement and child developmental outcome are related, but if there is a cause/effect relationship, the direction of that relationship is uncertain. This uncertainty is compounded by the fact that parents rated as more involved had children with more severe delays as indicated by pretest total DQs. It may also be that teacher ratings of parent involvement were related to child developmental progress or to the teachers' relationships with the parents. The latter possibility is supported by the relationship between parent satisfaction data and teacher rating of parent involvement data. Unfortunately, we found no unbiased and reliable way of assessing parent involvement. Thus, it is not possible to draw conclusions from this finding.

Regarding parent stress, a relationship between family cohesion, resources, and stress was suggested above. The data suggest that families that report higher levels of cohesion and resources also report less stress. Dividing families into groups of high and low cohesion and high and low resources indicated that level of resources

Table 3.15

Posttest Measures of Child Functioning for Parent Involvement Groups for Arkansas Intensity Study

		Less Involved				More Involved						
Variables	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	P Value	ES^
POSTTEST #1 CA (months)		35.5	(13.0)		38	35.6	(13.4)		29	1.07	.84	.01
Battelle Developmental Inventory* (BDI)												
Personal-Social	1,2	65.1	(26.1)	60.0	38	54.0	(33.7)	59.1	29	.05	.82	-.04
Adaptive Behavior	1,2	49.0	(18.8)	45.2	38	37.4	(23.7)	41.3	29	3.05	.09	-.21
Motor	1,2	72.2	(29.7)	65.7	38	50.2	(35.6)	56.6	29	7.19	.01	-.31
Communication	1,2	33.1	(14.6)	29.9	38	27.7	(18.9)	30.8	29	.15	.70	.06
Cognitive	1,2	27.8	(11.9)	25.4	38	22.5	(16.6)	24.9	29	.04	.84	.04
TOTAL	1,2	247.1	(95.1)	226.2	38	191.9	(122.7)	212.8	29	1.76	.19	-.14
Pretest BDI Raw Score	2	199.0	(83.4)	197.5	38	161.9	(109.6)	163.4	29	4.61	.04	-.42
POSTTEST #2 CA (months)		45.6	(13.5)		36	45.8	(12.7)		25	1.13	.77	.01
Battelle Developmental Inventory* (BDI)												
Personal-Social	1,2	84.0	(33.2)	75.1	36	75.6	(45.2)	84.4	25	3.58	.06	.28
Adaptive Behavior	1,2	56.8	(22.2)	51.5	36	45.6	(26.6)	50.9	25	.05	.83	-.03
Motor	1,2	82.9	(34.6)	74.8	36	56.0	(38.5)	64.1	25	5.56	.02	-.31
Communication	1,2	39.7	(19.0)	34.7	36	36.6	(24.3)	41.5	25	5.79	.02	.36
Cognitive	1,2	32.9	(16.3)	29.0	36	28.2	(19.0)	32.1	25	2.07	.16	.19
TOTAL	1,2	296.2	(117.5)	265.1	36	242.0	(147.6)	273.0	25	.41	.53	.07
Pretest BDI Raw Score	2	58.1	(19.7)		36	39.4	(28.2)		25	9.31	.00	-.95
POSTTEST #3 CA (months)		58.3	(13.9)		33	59.2	(13.9)		25	1.01	.99	.08
Battelle Developmental Inventory* (BDI)												
Personal-Social	1,2	102.0	(39.0)	90.6	33	86.2	(51.8)	97.6	23	.97	.23	.18
Adaptive Behavior	1,2	69.2	(23.7)	62.3	33	50.7	(31.3)	57.6	23	1.66	.20	-.20
Motor	1,2	93.4	(37.2)	82.6	33	69.0	(51.3)	79.8	23	.24	.62	-.08
Communication	1,2	50.2	(23.4)	43.6	33	42.3	(30.4)	48.9	23	1.76	.19	.23
Cognitive	1,2	46.0	(26.1)	39.9	33	36.0	(29.1)	42.1	23	.30	.59	.08
TOTAL	1,2	361.1	(140.3)	319.3	33	284.1	(186.8)	325.9	23	.11	.74	.05
Pretest BDI Raw Score	2	203.0	(83.3)	202.8	33	159.6	(113.7)	159.8	23	5.80	.02	-.52
POSTTEST #4 CA (months)		69.1	(13.8)		33	69.2	(15.2)		22	1.21	.61	.01
Battelle Developmental Inventory* (BDI)												
Personal-Social	1,2	112.4	(37.0)	103.4	33	99.4	(51.6)	108.5	22	.50	.48	.14
Adaptive Behavior	1,2	73.3	(22.7)	68.1	33	58.5	(30.0)	63.7	22	1.10	.30	-.19
Motor	1,2	101.4	(38.0)	93.0	33	78.5	(51.2)	86.8	22	.84	.36	-.16
Communication	1,2	56.1	(25.7)	50.5	33	50.7	(32.1)	56.4	22	1.81	.18	.23
Cognitive	1,2	53.2	(28.1)	48.1	33	43.3	(32.3)	48.4	22	.01	.94	.01
TOTAL	1,2	393.5	(146.1)	359.7	33	330.3	(187.0)	364.1	22	.04	.87	.03
Pretest BDI Raw Score	2	191.3	(79.5)	194.1	33	159.7	(113.7)	156.8	22	4.41	.04	-.43

* Statistical analysis for BDI scores were conducted using raw scores.

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

♦ Covariates: 1 = Pretest BDI Total Raw Score; 2 = Chronological Age at Prestest

was a better predictor of stress than cohesion. Median splits were determined for total FRS score at each posttest to assign groups at that posttest. Covariates included pretest PSI total scores, posttest FACES cohesion scores, and posttest FILE scores. Data in Table 3.16 indicate that statistically significant differences in stress were reported at posttests 2 and 4, and at least one effect size larger than .20 was found at all posttest sessions. This suggests that a family's perception of resources available may serve to reduce perceived stress. It may also be, however, that some families are "resource users" who take advantage of resources available to them, while others are "self-reliant" in that they do not make use of resources outside the family (Gallagher, 1990). In the latter case, resource users would be less stressed from the beginning. Table 3.16 indicates that high resource families were less stressed at pretest, providing support for the "resource user"

Table 3.16

Posttest Family Stress Data for Alternative Resource Levels for Arkansas Intensity Study

		Low Resources					High Resources							
Variable	Covariate[♦]	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	p Value	ES[^]
PRETEST														
Parent Stress Index (PSI)[•]														
Child Related	1,2	116.7	(26.6)	117.4	86	26	116.2	(22.4)	115.5	82	31	.15	.71	.07
Other Related	1,2	129.0	(30.9)	131.4	68	26	134.5	(28.2)	132.2	68	31	.03	.86	-.03
TOTAL	1,2	245.7	(53.5)	248.7	79	26	250.7	(43.9)	247.7	78	31	.02	.89	.02
POSTTEST #1														
Parent Stress Index (PSI)[•]														
Child Related	3,4,5	116.7	(26.6)	117.4	86	26	116.2	(22.4)	115.5	82	31	.15	.71	.07
Other Related	3,4,5	129.0	(30.9)	131.4	68	26	134.5	(28.2)	132.2	68	31	.03	.86	-.03
TOTAL	3,4,5	245.7	(53.5)	248.7	79	26	250.7	(43.9)	247.7	78	31	.02	.89	.02
POSTTEST #2														
Parent Stress Index (PSI)[•]														
Child Related	3,4,5	113.3	(28.6)	114.4	80	24	117.2	(27.2)	116.0	85	29	.07	.63	-.06
Other Related	3,4,5	124.6	(31.9)	126.2	60	24	137.1	(25.9)	135.5	73	29	3.00	.09	-.28
TOTAL	3,4,5	234.5	(53.7)	237.0	68	24	258.1	(47.1)	255.6	84	29	3.64	.06	-.35
POSTTEST #3														
Parent Stress Index (PSI)[•]														
Child Related	3,4,5	116.7	(26.6)	117.4	86	26	116.2	(22.4)	115.5	82	31	.15	.71	.07
Other Related	3,4,5	129.0	(30.9)	131.4	68	26	134.5	(28.2)	132.2	68	31	.03	.86	-.03
TOTAL	3,4,5	245.7	(53.5)	248.7	79	26	250.7	(43.9)	247.7	78	31	.02	.89	.02
POSTTEST #4														
Parent Stress Index (PSI)[•]														
Child Related	3,4,5	113.3	(28.6)	114.4	80	24	117.2	(27.2)	116.0	85	29	.07	.63	-.06
Other Related	3,4,5	124.6	(31.9)	126.2	60	24	137.1	(25.9)	135.5	73	29	3.00	.09	-.28
TOTAL	3,4,5	234.5	(53.7)	237.0	68	24	258.1	(47.1)	255.6	84	29	3.64	.06	-.35

[^] Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[•] Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores (adjusted) and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[♦] Covariates: 1 = FACE Cohesion (pretest); 2 FILE (pretest); 3 = PSI Total (pretest); 4 = FACE Cohesion (posttest); 5 = FILE (posttest) concept. Covarying for family cohesion (FACES) and stressors (FILE) accounted for group differences in those areas at each test session. Covarying for pretest stress at all posttest sessions may have been too conservative a procedure in addressing this issue, yet differences were identified (Cohen [1988] defined an effect size of .25 as a "medium" effect size). This gives evidence that families that use available resources are less stressed than those who do not use or who do not have resources available. It does not answer the question raised by Gallagher concerning family type with respect to the use of available resources. Unfortunately, our data do not address that specific question.

Conclusions

The absence of statistically significant differences in child development between groups raises serious issues for consideration among providers of home-based early intervention services. Though one study is certainly not definitive and should not be the basis for final policy determination, the evidence provided here clearly indicates that doubling home visit frequency (from once to twice per week) results in no measurable differences in child or family functioning. In fact, the data suggest that such an increase in frequency may serve to increase stress. The absence of an intervention group-by-severity of delay interaction serves to strengthen the findings relative to child functioning. Although it may be argued that the BDI is not an appropriate measure for children with severe delays, there is no standardized measure available to assess the development of children with the range of delays included in this longitudinal investigation.

While this conclusion may be disheartening for providers of home-based services, when viewed from the families' perspective it could also be a very encouraging finding. That is, it indicates that while children receiving the less frequent home visits function as well as those receiving more, the families in the less frequent group are less stressed. This suggests that children and families may not need as much outside help as we professionals tend to think they do. In keeping with the P.L. 99-457 call for empowering families, if we assume that empowerment reduces stress, the implication is that less direct intervention is more empowering. Given the high stress level reported by families at both frequency levels, the above assumption does not seem unreasonable.

This study fails to support the efficacy of expanding home visit services from once to twice per week. Although larger frequency differences are not addressed, children in the first cohort did receive one year of service at an approximately 3:1 ratio (based on attendance data; see Table 3.5). While attrition was substantial, the data suggest that it favored the more frequent intervention group. These findings are in clear contrast with the conventional wisdom that more frequent home visits are more effective than less for children with severe disabilities.

Findings from the analysis of parent involvement data gathered in this study are ambiguous as noted above, but the effect size data do suggest that this may be an area worthy of further investigation. Parent involvement data also add support to the conclusion that increased home-visit frequency does not result in improved child or family functioning. Parents in the more frequent intervention group were rated by home-visitors as more involved than parents in the standard frequency group. This fact favors improved performance among the experimental group, but the data fail to demonstrate such performance.

Analyses of parent stress by level of resources available, while demonstrating that resources can reduce stress, fail to address the more important issue concerning the types of families likely to use resources. There are at several ways of looking at this issue. First, one could ask whether providing resources to under-utilizers reduces stress. Second, one could seek to determine the specific characteristics of families that do and do not utilize available resources. The use of measures of locus of control in the EIFI follow-up studies may begin to address the latter approach. Future research should be designed to assess family coping styles prior to and after intervention.

This investigation addressed several weaknesses from previous research. It included random assignment to groups, the use of naive diagnosticians, several methods of treatment verification, and measures of family functioning. Perhaps the strongest features of this investigation are that the less frequent intervention was the frequency of choice among a majority of home-visit programs (Roberts & Wasik, 1990) and that the intervention was provided by existing service agencies. The study of existing service providers increased the generalizability of findings by eliminating the possibility that any group differences could have been attributed to an expensive "model" program that is difficult if not impossible to replicate. The semi-rural location of the agencies further enhanced the generalizability of the findings to locations in which home-visiting is often the only viable option.

As noted above, this study is in need of replication before final policy decisions are made. Given the mandates of P.L. 99-457 and P.L. 101-476, I would suggest a comparison of a "pre-packaged" intervention model (e.g. a once per week home visit) versus a negotiated intervention plan that is individualized to each family's needs and desires. Such a study should include random assignment and other methodological safeguard used in the present study, with concerted efforts to control attrition. To address the needs of children with severe delays, some less formal assessment procedure should supplement any standardized measures used. Perhaps something as simple as a structured parent interview might reveal the subtle progress often made by these children. In the absence of significant progress among this group, evidence that intervention has enabled families to keep their children with severe disabilities at home would provide support for the cost effectiveness of early intervention services.

JORDAN SCHOOL DISTRICT

Project #4

COMPARISON: Children with Mild to Severe Disabilities--Participation in a 3-day-per-week, center-based preschool program versus participation in an enhanced 5-day-per-week, center-based preschool program.

SITE COORDINATOR: Chris Giacovelli, Early Intervention Program Coordinator, Jordan School District

EIRI COORDINATORS: Mark Innocenti and Linda Goetze

LOCATION: Midvale, Utah

DATE OF REPORT: 11-12-1991

Rationale for the Study

Limited evidence exists in the early intervention literature to guide program decisions concerning the relative effectiveness of various intensities of program efforts (Casto & Mastropieri, 1986; Innocenti & White, 1991; White & Casto, 1985). The frequency and intensity of services in early intervention programs varies widely, based on factors such as philosophical orientation and professional judgement of child needs.

With the passage of the federal mandate to provide services to all preschool-aged children with disabilities (P.L. 99-457), the intensities of programs may change to reflect the effect of more children in programs and related funding and personnel issues. One result may be that programs will decrease their intensity in an attempt to serve more children with the same level of funding. Conversely, this legislation may increase the number of individuals who advocate in favor of increased intervention for young children with disabilities. This could generate increased financial support which might result in more intensive programs being offered to such children.

Decisions that can potentially affect the lives of children and their families, such as the intensity of a program, must be made using a data base of the benefits and costs of programs of varying intensity rather than be made according to bureaucratic needs or well-meant lobbying efforts. This study will help provide information for this data base by comparing two common intensity levels of intervention services for preschool-aged children with disabilities.

Review of Related Research

The field of early intervention commonly holds the belief that more is better (Casto & Mastropieri, 1986). Although this belief is common to our culture in many areas, it may not be valid in all cases (e.g., the megavitamin controversy; Perils of, 1987; Vitamins, 1986). Unfortunately, even though treatment intensity may be an important variable for early intervention programs, little systematic research has investigated whether more intensive programs are better for children or families (Bailey & Bricker, 1984; Casto & Mastropieri, 1986; White & Casto, 1985).

Table 4.1 summarizes characteristics of four previous studies that directly compared center-based early intervention programs of different intensities for children with disabilities (Barnett & Pezzino, 1987; Jago, Jago, & Hart, 1984; Lovass, 1987; Taylor, White, & Pezzino, 1984) and two studies which made similar comparisons for children from low socioeconomic backgrounds (Blank & Solomon, 1968; Washington & Osborne, 1969). A more thorough discussion of these studies is given in Innocenti and White (1991), but a brief summary is given here.

The most intensive study, Lovass (1987), shows the greatest efficacy with an ES of 1.41, quite clearly supporting the hypothesis that more intensive programs have

Table 4.1

Studies Which Examined Intensity of Early Intervention in a Center-Based Setting

Reference	More Intensive Group	Less Intensive Group	Study Quality	Duration of Program	Child-Risk Factor	Effect[♦] Size
Barnett & Pezzino (1987)	Full-day, five-day-per-week, center-based preschool program; school district operated.	Half-day, five-day-per-week center-based preschool program; school district operated.	Good	Academic year (9 months)	Disabled	-.11
Blank & Solomon (1968)[*]	Five days of individual tutoring in addition to 5-day-per-week nursery school placement.	Three days of individual tutoring in addition to 5-day-per-week nursery school placement.	Fair	45 days (9 weeks)	Disadvantaged	.57
Lovass (1987)[*]	Forty hours of one:one behaviorally oriented treatment per week (treatment carried out in home, school, and community).	Ten hours of one:one behaviorally oriented treatment per week (treatment carried out in home, school, and community).	Fair	2 years, up to 6 years (child dependent)	Disabled	1.41
Jago, Jago, & Hart (1984)[*]	Two mornings per week of center-based activities focused on language development and total communication. Parents were involved one morning per week.	One morning per week of center-based activities focused on social and self-help skills.	Poor	7 months	Disabled	.15
Taylor, White, & Pezzino (1984)	Full-day, five-day-per-week center-based preschool program, school district operated.	Half-day, five-day-per-week center-based preschool program, school district operated.	Good	9 months	Disabled	.10
Washington & Osborne (1969)[*]	Half-day school district kindergarten five-days-per-week, plus half-day center program focused on academic skills 5-days-per-week.	Half-day school district kindergarten five-days-per-week.	Fair	9 months	Disadvantaged	.80

[*] Studies also included nonintervention or combined intervention groups. These other groups are not included here.

[♦] Effect size is the average effect size across all dependent measures reported in the study.

positive results. Two of the remaining five studies show strong, positive effect sizes, while the other three are small or negative. The two studies which were rated highest on methodological quality have opposite signs and relatively low effect size. The authors of both of these studies pointed out potential confounds in the intensity comparisons (i.e., "longer is not necessarily more"). The comparison in the Taylor study was a full vs. half-day intensity difference, but it was noted that the second half of the full-day intervention included activities like nap and lunch time. The Barnett and Pezzino intervention comparison was organized in a similar way. Consequently, there may not have been twice as much time spent in instructional activities in the full-day program as in the half-day programs.

The two studies with disadvantaged children were done fairly well and show moderately large effect sizes, although it is unclear whether the results of studies done with disadvantaged children should be generalized to children with disabilities since there are so many differences between the two groups. The Jago, Jago, and Hart study was of very poor methodological quality. The Lovass study shows incredibly positive results for one subgroup of children with disabilities. However, it has not yet been replicated and the intensity of the high-intensity group is so high that it may be unrealistic to expect that it could ever be done for all children with disabilities at public expense, and it is not clear that the results are even conceptually applicable to non-autistic children with disabilities, which constitutes over 99% of all children with disabilities.

In drawing conclusions about whether more intensive early intervention programs will be better for children with disabilities, we are left with two well-done studies which show very small effects and one fairly well-done study which may not be relevant to questions about how most early intervention programs for children with disabilities should be structured. Furthermore, the results of these three studies are not consistent, and there are a number of other parameters of intensity which need to be investigated. In spite of the rather consistent claim in the literature that more intensive programs are better, it is clear that not much evidence exists. Given the importance of the question in terms of the resources available for early intervention as well as the potential benefits for children, this seems to be an area which is urgently in need of more research.

If more intensive interventions are really more effective, one would expect that those studies which made experimental vs. control group comparisons where the experimental group was relatively intense would find greater differences than those experimental versus control group comparisons where the differences between experimental and control groups were not as intense. Although such evidence is indirect, it is the type of evidence cited in some reviews of the literature which have concluded that more intense early intervention programs are more effective (see for example, Bryant and Ramey, 1987; and Dunst, Snyder, and Mankinen, 1989. A much more comprehensive data base to examine this hypothesis than previously used is available in a meta analysis conducted by EIRI of approximately 200 experimental versus control studies of early intervention (see Casto, White, & Taylor, 1983, for a complete discussion of this analysis). By investigating the average effect size for experimental vs. control group comparisons where the total hours of intervention, the hours of intervention per week, and the duration of intervention in weeks for the experimental group were different, we can at least see whether the results are consistent with the hypothesis that more intensive intervention programs will be better. As shown in Table 4.2, differences between experimental and control groups are no greater for those studies where the experimental group was "more intense" or of "longer duration" than in those studies where the experimental group was less intense or of shorter duration. Admittedly, these data may be confounded by a number of other factors (the severity of subjects participating in the studies, the types of dependent measures used, the training of the people delivering the intervention, etc.). For this analysis to be valid, it assumes that all of those other variables

Table 4.2

Average Effect Size for Different Intensity Factors From Studies Examining Early Intervention on Children with Disabilities

	Quality of Studies*			
	Good	Fair	Poor	Total
Total Hours of Intervention				
< 50	.78 (4 [2])+	1.01 (12 [3])	.89 (18 [6])	.92 (34 [10])
50 - 249	—^	.08 (3 [1])	1.20 (19 [5])	1.05 (22 [6])
250 - 499	—	.54 (5 [2])	.65 (13 [8])	.62 (18 [8])
500 - 749	.66 (2 [1])	3.31 (1 [1])	.41 (21 [4])	.54 (24 [6])
750 - 999	—	—	1.16 (5 [3])	1.16 (5 [3])
1000 - 1999	.52 (2 [1])	.66 (8 [2])	.59 (7 [3])	.62 (17 [5])
≥ 2000	—	.69 (2 [1])	1.32 (6 [2])	1.16 (8 [2])
Hours of Intervention Per Week				
< 2	.78 (4 [2])	1.34 (1 [1])	1.17 (11 [4])	1.08 (16 [7])
2 - 4.9	—	.89 (16 [2])	1.03 (31 [7])	.98 (47 [7])
5 - 9.9	—	—	.53 (15 [5])	.53 (15 [5])
10 - 12.9	—	1.19 (4 [2])	.71 (11 [9])	.83 (15 [10])
13 - 19.9	.84 (6 [2])	.30 (5 [2])	.44 (22 [4])	.49 (33 [8])
20 - 39.9	.52 (2 [2])	.70 (4 [1])	.86 (5 [3])	.74 (11 [5])
≥ 40	—	—	—	—
Duration of Intervention (Weeks)				
≤ 12	.39 (8 [3])	1.44 (7 [3])	.83 (25 [10])	.85 (40 [15])
13 - 25	.13 (2 [1])	.55 (28 [4])	.83 (41 [15])	.70 (71 [19])
26 - 38	—	.57 (23 [8])	.71 (81 [27])	.68 (104 [33])
39 - 51	.65 (11 [2])	.70 (8 [2])	.96 (40 [23])	.87 (59 [26])
52 - 77	—	.64 (8 [3])	1.00 (24 [11])	.91 (32 [14])
78 - 103	—	.69 (2 [1])	.90 (13 [6])	.87 (15 [6])
≥ 104	.10 (6 [1])	.01 (7 [1])	.49 (11 [4])	.26 (24 [5])

NOTES: *Based on threats to internal validity

+(# of Effect Sizes [# of studies])

^No data for cell

are evenly balanced across the various categories of intensity, and this may not be the case. At any rate, there is little support here for the hypothesis that more intensive interventions are more effective and this emphasizes the need to conduct well-controlled, methodologically sound, studies to address the intensity question.

Intensity of intervention may vary according to total hours of intervention, staff:child ratio, duration of intervention in weeks, or hours per week of intervention. While no single study can address all intensity variations, this study directly examined one aspect of the question of program intensity. This study, which presents the results of a comparison of a 3-day versus a 5-day-per-week early intervention preschool program, may be of particular importance, since both levels of intensity represent typical intervention programs, and study results could affect personnel and funding issues. Because the effects of intervention on parent and family functioning have not received sufficient investigation in previous early intervention research (Casto & Mastropieri, 1986; Dunst, 1986), the impact of these different program intensities on parents and families, as well as their child, was examined.

Overview of Study

Intensity has many dimensions (e.g., programs may vary hours per day of intervention, days per week of intervention, degree of engaged learning time in which children are involved, etc.). This study contrasted preschool intervention services for children participating in two different levels of intervention as defined along a number of different intensity dimensions. First, children in one group received 5-days-per-week, 2-hours-per-day preschool intervention services in classrooms established to provide appropriate, child-centered services for children with disabilities (more intensive group). Children in the other group received 3-days-per-week, 2-hours-per-day preschool intervention services in the same classroom format (less intensive group). The more intensive condition in this study also had a 3:1 child/teacher ratio, while a 5:1 child/teacher ratio existed for the less intensive condition classrooms. A third dimension along which intensity was different was that more intensive condition classrooms were provided with increased availability of communication and motor therapists. In practice, this increased therapy time resulted in the presence of a speech and language therapist in more intensive condition classrooms each day they were in session, while the speech and language therapists were available on an every-other-day basis for the less intensive classroom condition. Differences in program efficacy were evaluated by assessing child and family outcomes.

Method

This study was conducted in conjunction with the early intervention program of the Jordan School District, a suburb of Salt Lake City, Utah. The Jordan School District has a history of active involvement in early intervention. Although prior to the 1987-88 academic year, early intervention services had been funded by the Utah Division of Social Services, the intervention services were housed in a school in the Jordan District. With the passage of P.L. 99-457 and State of Utah mandates, the district assumed the financial and administrative responsibility for early intervention for all preschoolers with disabilities living in the area. This resulted in the district expanding early intervention classrooms into neighborhood schools while retaining experienced staff. At the time of this study, the Jordan District maintained early intervention rooms at three schools. The district offered a variety of intervention options ranging from home intervention, to various classroom mainstream options, to placement in neighborhood daycare centers.

The early intervention program previously provided 5-days-per-week, 2½ hours-per-day, classroom-based intervention services to a limited number of qualified children. Children who met both age and Utah State Office of Education developmental criteria, as explained in the Recruitment section below, were placed on a waiting list, and classroom slots were filled on a first-come basis. When responsibility for preschool services was transferred to the school district, the district began serving all eligible preschoolers and providing transportation. These factors resulted in a change in the service structure of the preschool program to a 3-days-per-week, 2-hours-per-day program.

This change in program intensity raised concerns from preschool providers, school administrators, and parents of children with disabilities. In conjunction with the Early Intervention Research Institute (EIRI), the Jordan School District received additional funds from the Utah State Office of Education to determine whether a more intensive (and consequently, more expensive) early intervention program would result in measurable benefits for children and families. The specific comparison investigated was established through negotiations with all participating agencies. Based on the amount of additional money available from the State Office of Education, the school district was directed to design a more intensive intervention program which they believed would have the greatest likelihood of benefitting children and families. They were free to vary whatever parameters (e.g., length of day, number of days per week, student:teacher ratios, availability of therapists, etc.) that they thought would have the greatest impact. This specific comparison design is described more completely in a subsequent section.

Subjects

Subjects for this study came from four classrooms located at two schools (two classrooms per school). All subjects were recruited for this study at the beginning of the 1988-89 school year. Fifty-three children (28 less intensive, 25 more intensive) between 36 and 62 months of age ($\overline{x}$ = 50 months) participated in the study. Sixteen children in the less intensive group were male, and 8 males were in the more intensive group. The age equivalent for the children, based on the total score of the Battelle Developmental Inventory (BDI), ranged from 16 to 46 months (mean = 30 months). The majority of children were mild to moderately disabled (65% of children had DQs of 65 or below; no child had a DQ lower than 40).

Recruitment. The Utah State Office of Education criteria for acceptance into the early intervention program specified that preschool-aged children were eligible for services if they demonstrated a delay from the norm of -1.5 or greater standard deviations in three developmental areas, of -2.0 or greater standard deviations in two developmental areas, or -2.5 or greater standard deviation in one developmental area. Multiple assessments and evaluators were used by the school district in determining eligibility.

All parents of children identified as disabled at the schools where the classrooms were located were considered for participation in this study. Parents were either verbally informed or sent a letter regarding the study. Parents were then given an informed consent form to read and to indicate their agreement or refusal to participate. The site contact person was available to answer parent questions and concerns. Approximately 5% of parents refused participation. The majority of these refusals were from parents of younger children who desired the less intensive program.

Assignment to groups. During the one-year intervention study period, subjects attended one of two schools, dependent on address. In each school, one of two classrooms was established as a more intensive classroom. Two teachers, one at each school, conducted both a less and more intensive classroom. The time of day services were delivered (morning or afternoon) was counterbalanced across schools.

After a child was identified and the parents indicated a willingness to participate, the site contact sent information about the child (including a rating of degree of disability [mild, moderate, severe] based on the initial district assessment) to the EIRI research coordinator. This information was used to place each child in a school by severity matrix (2 x 3). For subjects in each cell, there were four possible sequences of assignment (ABAB, BABA, ABBA, and BAAB; where A = the more intense group and B = the less intense group). A die was cast to determine the assignment sequence for each set of 4 children in each cell. This process was repeated for each cell of the matrix as the first child in a cell was identified.

Attrition. Fifty-three subjects were recruited to participate in this study at the beginning of the 1988-89 school year. To date, none of the subjects have been lost. Posttest data for two follow-up years were obtained for all 53 subjects and their parents. Posttest #3 data is complete for 53 subjects and 52 parents.

Demographic characteristics. The subject pool for this study is complete. Funds provided by the Utah State Office of Education were for a single year. The demographic characteristics of the population sample in this study approaches what many consider the "typical" American family (see Table 4.3). The average parents in the study had slightly more than a high school education and were in their early 30s. In 92% of the families, the parents of the child were married and living together, and the mother was the primary provider of child care (96%); families had an average of four children, including the child with disabilities. Fathers worked a 40-hour week in either blue collar or technical/managerial positions; mothers did not work or held part-time jobs. The average family income was $30,000. All the families spoke English as their primary language, and the majority (94%) were Caucasian.

Demographic differences between the subjects in the less and more intensive groups can be evaluated using the p-values and effect sizes given in Table 4.3. Statistically significant differences ($p < .10$) existed for percent male subjects, years of education for the mother, hours per week mother was employed, and number of siblings. The more intensive subjects had more educated mothers who worked more each week than the less intensive subjects. The more intensive group also had a higher percent of children in daycare than the less intensive group. The number of

Table 4.3

Comparison of Groups at Pretest on Demographic Characteristics for Jordan Intensity Study

Variable	Less Intensive			More Intensive			p Value	ES[^]
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Age of child in months	50.0	6.8	28	50.3	6.3	25	.88	.04
• Age of mother in years[+]	32.5	4.5	28	32.6	6.6	24	.95	.02
• Age of father in years[+]	35.0	4.2	28	34.9	6.0	24	.68	.02
• Percent male[*] [+]	43		28	68		25	.07	.51
• Years of education for mother	12.7	1.9	28	14.2	1.9	25	.01	.79
• Years of education for father	13.8	1.8	26	14.3	2.5	24	.37	.28
• Percent with both parents living at home	100		28	84		25	.25	.32
• Percent of children who are Caucasian[*]	96		28	92		24	.47	.20
• Hours per week mother employed[+]	8.3	14.8	28	17.0	20.4	25	.08	.59
• Hours per week father employed[+]	42.3	17.9	28	38.6	16.6	22	.45	.21
• Percent of mothers employed as technical managerial or above[*]	7.0		28	21.0		24	.16	.40
• Percent of fathers employed as technical managerial or above[*]	36.0		28	12.2		23	.25	.33
• Total household income	$26,821	$8,572	28	$34,380	$23,512	25	.11	.88
• Percent with mother as primary caregiver[*]	100		26	92		26	.50	.19
• Percent of families using daycare on a daily basis[*] [+]	32		28	48		25	.25	.32
• Number of siblings[+]	3.1	1.9	28	2.0	1.5	25	.02	.58
• Percent with English as primary language	100		28	100		25	1.00	.00

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[+] Absolute values of the ES are reported.

[^] $$ES = \frac{\bar{x}\ (\text{more}) - \bar{x}\ (\text{less})}{SD\ (\text{less})}$$

siblings in families receiving the less intensive treatment was higher than in the more intensive intervention families.

Logically, these differences between the demographic characteristics of the more and less intensive subjects and their families are interconnected. More educated mothers could be expected to work more as their earnings in jobs outside the home would, on average, be higher. Families with two parents who work also could be expected to have a higher mean income than families where only the father is employed. Families where the mother is employed outside the home more hours use daycare more than families where the mother works only in the home or fewer hours outside the home. Finally, the number of siblings is higher for the less intensive group who use daycare less and have relatively less educated mothers. It has been shown that, on average, more educated parents tend to have fewer children. More siblings raises the cost of using daycare and lowers the benefits from the mother working outside the home.

The results of the analysis of pretest differences on 17 demographic variables indicate a few differences between the groups as the intervention began. In some cases, these differences favor the more intensive group and in others the less intensive group. For example, the more intensive group had better educated mothers and higher incomes, but the less intensive group had a higher percentage of both parents living at home and a higher percentage of fathers employed as technical/managerial level or above. In most cases, the differences were quite small, and only 4 of 17 were statistically significant ($p < .10$). If there is any bias in the random assignment, it would slightly favor the more intensive group. Analysis of covariance, using those variables which were correlated with outcomes and for which pretest differences were largest, was used to adjust for biases that may have existed following random assignment.

Intervention Programs

At the time this research was initiated, the early intervention program of the Jordan School District was mandated to provide services to all children with disabilities, ages 3 to 5 years, who resided within district boundaries. The majority of these children were served in two schools that also served as elementary schools for children without disabilities. Other service options were possible (home services, self-contained school placement, services in a daycare center) according to the needs of the child. Classrooms within the two most populous schools within the district were selected for research involvement. Children in both the less and more intensive programs were located at each school.

To determine whether program intensity was related to outcomes, it was critical that other factors be held as constant as possible. At each school, teachers had morning and afternoon sessions. Two teachers were involved in this study (one per school), and each taught a less and more intensive classroom. At one school, the less intensive class was a morning class, at the other an afternoon class. This arrangement helped control for differences resulting from factors other than intensity.

One difference in the two schools was that one of the schools (one less and one more intensive condition classroom) used a reverse mainstreaming arrangement to provide services. In this school, regardless of condition, the classrooms were composed of 50% children without disabilities three days per week. The classrooms at the other school were not similarly mainstreamed. Instead, children from different classrooms were brought together for playground and nonacademic activities (e.g., music and art). The classroom at this school also used some peer tutors in the special education classrooms.

Children were initially assessed for early intervention placement by a transdisciplinary team of professionals using norm-referenced assessment measures of general development. These assessment protocols were then forwarded to the teacher for eligible children. Based on this information, the teacher requested and received additional assessment information for speech/language or motor functioning. Once enrolled in the program, the child received a criterion-referenced assessment by the teacher. Information from all these sources was then combined at a meeting, in which the parent participated, to develop an Individual Education Plan (IEP) for the child. The IEP then dictated the specific nature of intervention services for that child.

Each classroom consisted of approximately 15 children. The majority of these children were in this study, but children who were not participating in the intensity comparison could also have been in one of the less intensive classrooms. Each classroom was staffed by one certified teacher who had access to paraprofessional aides, communication therapists, physical and occupational therapists, and a behavior specialist. Access to aides and communication therapists varied by condition as described below. Child need (as per the IEP) dictated access to motor therapists and the behavior specialists, and this was equally distributed across conditions.

Teachers were free to select curricula of their choice, and classroom activities were drawn from different curricula. The primary curriculum for all classrooms can be described as theme-based and developmentally appropriate. It focused on teaching skills embedded in the daily activities. Both the teachers and communication therapists used this approach which focused on naturalistic teaching (c.f., Haring & Innocenti, 1989).

The daily organization of the classrooms was similar, regardless of experimental condition. The teacher established a number of activities that the children alternated through during the day. These activities were either directed by the aides or the teacher. Children rotated through these activities in small groups. Generally, teachers selected a number of themes that were emphasized during a school week. For example, the color green, the shape of a square, and the concept "under" were weekly themes. Large group activities, such as singing and calendar, were scheduled between other activities. Children were provided a snack activity each day. Children in need of more individualized instruction were pulled from other activities for individual or smaller (2-3 children) group instruction. Individualized instructional activities were usually conducted by the teacher.

Regular evaluation of each child's learning objectives was required as a part of the IEP process. Data on objectives were collected daily, weekly, monthly, or bi-annually, dependent on the objective. Specific criteria were set for each objective to guide evaluative activities.

Less intensive intervention program. This program consisted of a 3-days-per-week, 2-hours-per-day intervention service. The teacher:child ratio in the classroom was 1:5, with each classroom being staffed by a certified teacher and two paraprofessional aides. Communication therapy was provided primarily through a consultation model where classroom staff took primary responsibility for goals and implemented activities as appropriate throughout the school day. The communication therapist was in the classroom approximately every other school day. Some children received individualized therapy from the therapist on these days. In contrast to the more intensive intervention program, there was no group communication therapy activity conducted in the less intensive intervention program.

More intensive intervention program. Children in this group received 5-days-per-week, 2-hours-per-day intervention services. The teacher:child ratio in this class was enhanced from the standard program and consisted of a 1:3 ratio; one certified teacher and four paraprofessional aides per classroom. Communication therapy was delivered primarily through a consultation model, but the therapist was allowed more time to work with teachers. The communication therapist was in these classrooms every school day. The communication therapist, in addition to consultation and individual therapy, conducted a large group communication activity and conducted snack-time activities such that naturalistic language teaching interventions were included. Communication therapy occurred more often for the more intensive group and the large group activity was undertaken only in the more intensive group.

Treatment Verification

The information presented in this section includes data that was collected to verify that the alternative interventions were implemented as intended and information to document contextual variables that may have altered the comparability of children and families in the study.

Attendance. One method to verify that the alternative interventions were received was through child attendance data. If one group had attended more regularly than the other, it could have significantly compromised the research. Daily attendance records were kept by teachers, and these were forwarded to EIRI monthly. Regular attendance by subjects in both intensity groups is shown in Table 4.4. It is also clear from the number of days attended that the intensity of intervention was different for the two groups. The length of the school day was equal although number of days of intervention was significantly higher for the more intensive group.

Table 4.4

Treatment Verification data for Jordan Intensity Study

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Percent child attendance	90.0	(9.1)	28	92.5	(5.5)	25	.22	.27
• Number of days attended	98.5	(10.3)	28	165.1	(15.0)	25	.00	6.47
• Parent satisfaction[‡]	23.1	(4.5)	28	24.8	(2.9)	23	.11	.38
Staff working with child	3.8	(0.5)	28	3.8	(0.4)	24	1.00	.00
Ability to communicate w/staff	3.2	(0.8)	28	3.5	(0.6)	24	.17	.38
Program goals/activities for child	3.5	(0.6)	28	3.6	(0.6)	24	.35	.17
Participation in child's program	3.0	(0.9)	28	3.3	(0.8)	24	.31	.33
Services available for child	3.2	(0.9)	28	3.5	(0.6)	23	.16	.33
Child's progress	3.2	(0.9)	28	3.7	(0.6)	24	.04	.56
Child's program	3.3	(0.8)	28	3.6	(0.6)	24	.05	.38
• Teacher rating of parental[′] attendance	2.3	(0.8)	28	2.3	(0.8)	25	.89	.04
• Teacher rating of parental[′] knowledge	2.1	(0.8)	28	2.3	(0.8)	25	.52	.18
• Teacher rating of parental[′]	2.1	(0.7)	28	2.2	(0.7)	25	.64	.13

[‡] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program. Each question is scored from 1 to 4. Higher scores indicate greater satisfaction.

[′] Teacher rating is based on a scale with a range of 1-3. Higher scores indicate a better rating.

[^] $$ES = \frac{\bar{x}\ (\text{more}) - \bar{x}\ (\text{less})}{SD\ (\text{less})}$$

Supervisor ratings of teacher and staff. Teachers and other support staff were also evaluated using a structured form at the end of the intervention that was completed by their supervisor (the site contact) regarding their teaching techniques. Teachers and communication therapists at both schools were rated as being in the upper 25% of professionals with whom their supervisor had worked. The respective ratings, based on a 30-point scale, of the teacher and communication therapist were: 30 and 30 for one school; 24 and 28 at the other school.

Parent satisfaction. Another aspect of treatment verification was parent satisfaction with the program. Parent satisfaction was assessed through a seven-question scale completed at the end of the year-long intervention. The results of this questionnaire are presented in Table 4.4. No group differences were found except on those questions assessing satisfaction with child progress and the general program. Parents in the more intensive group were more satisfied with the progress their child had made and the program in general. It should be noted that average parent satisfaction in all areas was very high. Differences occurred within a narrow boundary of positive satisfaction.

Teacher ratings of parents. To determine if teachers of children during the one year intervention perceived differences in the skill levels of parents, they were asked to rate each parent regarding parent support of their child, knowledge of the intervention process and their child's development, and attendance at required activities. As shown in Table 4.4, no differences were found between the parents in the two groups on any of these measures. Teacher ratings of parents continued after the initial intervention period as well. The results of questions related to parent knowledge of the child's educational program shows a difference, with a *p*-value of .09 at Posttest #3 in favor of the more intensive group parents. No differences were found with respect to teacher ratings of parent support of the child's educational program for any of the other posttests.

Child health. The health of those children in the study could have been a disruptive factor affecting child and family outcomes. If children in one group experienced more health problems which were unrelated to the intervention, it could have biased the child and family outcome results. Parents completed a health questionnaire at Posttests #1, #2, and #3. Questions regarding a variety of health issues were asked. As shown in Table 4.5, no differences between groups were found on any of these health measures for any of the three posttests.

Table 4.5

Treatment Verification Data for Posttests #1, #2, and #3 for Jordan Intensity Study

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
POSTTEST #1								
• General Health of Child[♦]	2.0	(.6)	28	2.0	(.7)	22	.64	0
• Therapies received outside[*] school program								
Percent receiving outside[**] speech therapy	10.7		28	16.0		25	.57	-.14
Percent receiving outside[**] PT/OT therapy	14.3		28	4.0		25	.20	-.05
POSTTEST #2								
• General Health of Child[♦]	2.1	(.6)	28	2.10	(.6)	25	.94	0
• Therapies received outside[*] school program								
Percent receiving outside[**] speech therapy	25.0		28	16.0		25	.43	.19
Percent receiving outside[**] PT/OT therapy	14.3		28	4.0		25	.20	.28
POSTTEST #3								
• General Health of Child[♦]	2.1	(.6)	26	2.1	(.5)	24	.97	0
• Therapies received outside[*] school program								
Percent receiving outside[**] speech therapy	7.1		28	8.0		25	.26	-.04
Percent receiving outside[**] PT/OT therapy	14.3		28	12.0		25	.81	-.05

[♦] Based on parent rating of the child's health were 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[*] Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

[**] Statistical analyses are based on t-tests where those receiving services were scored "1" and those not receiving services "0." ESs are based on a probit transformation of percentage data.

[^] $$ES = \frac{\bar{x}\text{ (more)} - \bar{x}\text{ (less)}}{SD\text{ (less)}}$$

Family measures. Other contextual variables in the study were examined by having families complete the Family Inventory of Life Events at pretest and Posttest #1. The Holmes and Rahe was administered to families at Posttest #3. No statistically significant differences between the families in the two groups was observed on either measure.

Outside therapies. In a study such as this, it is possible that the parents of children in the less intensive group were supplementing their child's education with private therapies or instruction. Parents were interviewed at Posttest #1, #2, and #3 to examine this issue, and parents in each group reported any involvement in such supplemental activities. Supplemental hours of speech and motor therapy, are reported in Table 4.5. No statistically significant differences were found on the supplemental activities for Posttests #1, #2, or #3.

Site review. A major source of treatment verification information came from a site review conducted during the first year of the study. The purposes of this review were to (a) collect information about the nature and quality of early intervention services that were being delivered, (b) verify that the research being conducted by EIRI was being implemented as intended, and (c) collect assessment data that may have been useful to site administrators to guide internal changes and for use when seeking technical assistance. Purpose (a) and (b) were relevant to treatment verification.

The review was conducted by a team consisting of: (a) the EIRI staff person; (b) the Jordan District site contact; (c) the Preschool Specialist for the Utah State Office of Education; and (d) a Professor of Special Education at the University of Utah. The site review was structured by the EIRI developed Treatment Verification Guide. (A copy of the site review report and treatment verification guide can be obtained from EIRI.)

Site review findings indicated that the Jordan School District Early Intervention Program was delivering appropriate, quality intervention services. Variables that distinguished different intensities of programs were being fully implemented. The less and more intensive classrooms were clearly distinct with respect to student: teacher ratios, number of days per week the intervention occurred, and frequency of speech and language therapy. Staff of the Jordan Preschool were qualified, enthusiastic professionals whose goal was to provide quality services to preschool-aged children with disabilities. Teachers were commended on use of developmentally appropriate classroom activities and naturalistic teaching strategies. The program was competently administered and had in place a well-developed procedures manual. The program-developed transition procedures for information transfer were excellent. Minor suggestions for improvement were made regarding: daily lesson plans, data collection, IEP development, assessment for program entrance, and training for aides. No threats to the validity of the research study were found.

Ecobehavioral assessment. Another source of treatment verification information came from an ecobehavioral assessment of classroom activities. A concern with this intervention was whether classroom contexts and teacher behaviors varied for classrooms of different intensity. It is possible that time differences (hours/week) may not result in actual program intensity differences. For example, Carta, Sainato, and Greenwood (1988) examined preschool programs and found two that operated for different lengths of time, but where the instructional intensity was virtually equivalent. To account for possibilities such as this, an ecobehavioral observation instrument was used.

Ecobehavioral observation assesses program variables through systematic observation and measures moment-to-moment effects of the interaction between environment (classroom contexts), teacher behavior, and student behavior (c.f., Carta et al., 1988). The Ecobehavioral System for Complex Assessment of the Preschool

Environment (ESCAPE; Carta, Greenwood, & Atwater, 1986) was used for this observational assessment.

The ESCAPE was designed for use in preschool environments that serve students with disabilities. The ESCAPE assesses three major features of preschool early intervention programs: (1) the program ecology, (2) the behavior of teachers, and (3) the behavior of student participants. These three major categories are subdivided into 12 subcategories (see Table 4.6). All variables are recorded on a 15-second momentary time-sampling system where all categories are scored over a one-minute period. Each subcategory is examined and scored within a 15-second time period.

ESCAPE observations were conducted near the end of the first year. Each child was observed for three 10-minute samples, distributed across different days and time periods. Observations were conducted on all children in all classrooms. The only exception was one more intensive intervention subject who left school before observations were conducted.

To assess the reliability of the observation system, two observers recorded data concurrently and independently for 25% of the samples. Agreement between observers, calculated as the percentage of intervals in which both observers selected the same category for a particular variable, averaged 95% across variables, with a range from 86% to 100%.

Results from the ecobehavioral observation are presented in Table 4.7. This table presents results of teacher engagement and grouping of students in the classroom. Engagement values are determined based on a child's behavior across all student behavior categories during a single interval. Appropriate engagement is hypothesized to be the primary behavior contributing to child development (Carta et al., 1988; Greenwood, 1991; Greenwood, Delquadri, & Hall, 1984; Innocenti, 1990).

Table 4.6

ESCAPE Variable and Categories Within Variables for Jordan Intensity Study

Ecology Variables					
A.	**Designated Activity**				
	The overall format on structure of the activity in which the teacher has placed the target child.				
	Snack	Play	Transition	Preacademics	
	Fine Motor	Music/Dance/Recitation	Clean-up	Class Business	
	Story	Self-Care	Gross Motor	Time Out	
	Language Programming				
B.	**Activity Initiator**				
	The person who selected the activity in which the target child was engaged.				
	Teacher	Child	No one		
C.	**Materials**				
	Objects with which the target child is engaged or attending to				
	Large Motor Equipment	Art/Writing	Instructional	Pretend Play Toys	
	Manipulatives	Story Books	Audio-Visual	Food or Food Preparation	
	Bathroom	None	Other		
D.	**Location**				
	The physical placement of the child.				
	On Floor	At Table	In Chair	On Equipment	
	In Line	Undefined			
E.	**Grouping**				
	Solitary	One teacher with one student			
	Small group	Large group			
F.	**Composition**				
	Mix of handicapped and nonhandicapped student within a group.				
	All handicapped	Equal	Majority nonhandicapped		
	Majority handicapped	None			
Teacher Variables					
G.	**Teacher Definition**				
	Primary adult with whom the target child is interacting.				
	Teacher	Aide	Student Teacher	Volunteer	
	Ancillary Staff	Substitute Teacher	No Staff		
H.	**Teacher Behaviors**				
	Physical Assisting	Gesturing/Signing	Approval	Disapproval	Verbal
	Prompting	Verbal Instruction	Reading Aloud/Singing/Recitation	Discussion	No Response
I.	**Teacher Focus**				
	The direction of the behavior of the coded adult.				
	Target child only	Target child and others	No one	Other than target child	
Student Variables					
J.	**Target Behaviors**				
	Behaviors that indicate student attention, engagement, and for participation.				
	Academic Work	Pretending		Manipulating	
	Gross Motor Behaviors	Singing/Reciting/Dancing		Self-care	
	Transition	Attention	None		
K.	**Competing Behaviors**				
	Behaviors which are commonly considered to be unacceptable.				
	Acting-out	Off-task	Self-stimulation	None	
L.	**Verbal Behavior**				
	Verbal or signed expression.				
	Talk to Teacher	Talk to Peer	Undirected	No Talk	

Table 4.7

Percentage of Time in Categories Observed by the ESCAPE for the Jordan Intensity Study

Variable	Less Intensive			More Intensive				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Grouping								
Small Group	24.8	26.4	28	38.6	24.7	24	.06	.52
Large Group	71.0	27.1	28	52.8	24.8	24	.02	-.67
1 Teacher w/1 Student	1.5	3.7	28	2.7	8.0	24	.51	.32
Solitary	2.7	5.0	28	4.1	6.0	24	.36	.28
• Engagement								
Appropriate Engagement	42.2	19.6	28	43.2	18.6	24	.86	.05
Appropriate Not Engaged	30.8	17.3	28	29.3	16.1	24	.76	-.09
Appropriate Engagement w/Other Behavior	24.7	15.8	28	23.9	11.2	24	.84	-.05
Appropriate-Not Engaged w/Other Behavior	2.2	3.8	28	2.9	4.8	24	.54	.18

^ $ES = \frac{\bar{x}\ (\text{more}) - \bar{x}\ (\text{less})}{SD\ (\text{less})}$

Teachers, overall, responded similarly to children in both groups. Most importantly, levels of appropriate engagement were similar between the groups. These results suggest that the time of the children in both groups was spent engaged in very similar activities.

The major difference between the two groups was that the children in the more intensive classroom engaged in these activities for more hours per week than the children in the less intensive group. Also, subjects in the more intensive group spent significantly more time in small groups, while the less intensive children were in large groups more often. The intensity differences were designed to provide a higher teacher:child ratio for the time that subjects were engaged; the data in the grouping category suggests that the objective was achieved.

Cost of Alternative Interventions

The cost analysis for this study was conducted during the 1988-89 school year. Costs are based on those classrooms involved in the study (two less intensive, two more intensive). Cost estimates are based on a class of 15 students. Even though the number of subjects for the study was not 15 per class in all classes, classes were designed for 15 students. Cost data were obtained using the ingredients approach, a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs. It includes costs that are often omitted from cost analysis such as shared resources. As shown in Table 4.8, each alternative used direct service and administrative personnel, occupancy, equipment, transportation, and materials and supplies in varying amounts according to the intensity of program. Cost estimates on Table 4.8 are in 1990 dollars. In addition, undiscounted costs and costs discounted at real rates of 3% and 5% are given.

Table 4.8

Cost Per Child for Jordan Intensity Study

Resources	Less Intensive	More Intensive
1. UNDISCOUNTED COSTS		
Agency Resources		
Direct Services	$1,709	$3,570
Administration		
Preschool	623	623
District	35	59
Occupancy	294	502
Equipment	71	119
Transportation		
Children	405	676
Staff	14	22
Materials/Supplies	52	87
TOTAL	***$3,203***	***$5,658***
2. DISCOUNTED COSTS (3%):	$3,398	$6,003
3. DISCOUNTED COSTS (5%):	$3,531	$6,238

The three-day program operated one morning and one afternoon class for two hours per day, three days per week. Direct service personnel included a teacher, a speech and language therapist, a physical therapist, an occupational therapist, and two aides in each class. The five-day program also operated a morning and afternoon session. Classes were held for two hours per day, five days per week. The same staff conducted the five-day intervention with the addition of two aides. Of course, direct service staff reported devoting more of their total FTE to the five-day program. The salaries and benefits for direct service personnel were determined according to their FTE devoted to each program alternative.

Preschool administrative personnel included salaries and benefits for the program director and a secretary. Interestingly, they reported spending approximately the same proportion of FTE on administrative duties for both programs. District administration includes the school principal, the special education director, and other necessary district administration, as well as the bus drivers and bus aides. The administrative cost of operating the program on the district level was calculated according to the district's indirect rate for operating federal programs (1.1%). Occupancy charges, including space, maintenance, utilities, and insurance costs were based on the school district leasing cost of $6 per square foot per year. One thousand thirteen square feet were allocated for the three-day program, and 1,688 square feet for the five-day program. Annual equipment cost was determined by taking inventory of all instructional materials, office furniture, and equipment. Market replacement values were then applied to each item, costs were annualized accounting for interest and depreciation, and prorated according to usage by each alternative.

Child transportation included fuel, maintenance, depreciation, and the annualized cost of car seats/restraints. As previously noted, the cost for drivers, bus aides, and transportation administration are included under "administration." Staff travel was based on actual mileage (at $.205 per mile) for the teachers and therapists travel related to the respective intervention programs. The cost of materials and supplies were assessed based on actual usage of these items by each alternative.

Data Collection

It is important to note that the data collected for this study were collected to assess the effects of intervention not only on the children, but also on their families. As noted earlier, pretest data and data from Posttests #1, #2, and #3 have been collected. The instruments used to obtain data on children and their families and the posttest administration information on these instruments is presented in Table 4.9. A brief description of each of these instruments is presented in Table 4.10.

Table 4.9

Schedule of Administration and Tests Administered for Jordan Intensity Study

	Pretest	Posttest #1	Posttest #2	Posttest #3
CHILD MEASURES				
Battelle Developmental Inventory	X	X	X	
Woodcock-Johnson Tests of Achievement				X
Social Systems Rating Scale				X
Cooper Farran Behavior Rating Scale		X	X	
Scales of Independent Behavior				X
Joseph Preschool and Primary Self-Concept Inventory		X	X	
Harter Self-Concept				X
Developmental SPECS		X	X	X
FAMILY MEASURES				
Parent Stress Index	X	X	X	
Family Support Scale	X	X	X	X
Family Resource Scale	X	X	X	X
Family Inventory of Life Events and Changes	X	X		
Family Adaptation and Cohesion Evaluation Scales	X	X	X	
Parent Self-Awareness Scale				X
Comprehensive Evaluation of Family Functioning				X
Holmes and Rahe Major Life Events				X

Table 4.10

Description of Tests Administered for Jordan Intensity Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Woodcock-Johnson Tests of Achievement (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of nine aspects of scholastic achievement: Letter-word Identification, Passage Comprehension, Calculation, Applied Problems, Dictation, Writing Samples, Science, Social Studies, and Humanities.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1985)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: motor skills, social and communication skills, personal living skills, and community living skills.
Joseph Preschool and Primary Self-Concept Screening Test (JSI) (Joseph, 1979)	Assesses the self-concept of children ages 3.6 to 9.11 years via responses to line drawings. It provides a global self-concept score.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: communication, sensorimotor, physical, self-regulation, cognition, and self-social.
Social Skills Rating Scale (SSRS) (Gresham & Elliott, 1990)	A norm-referenced measure of child social skills and school success. Ratings are obtained from the child's parent and teacher.
Harter Perceived Self-Competence Scale (Harter & Pikes, 1983)	A pictorial scale of perceived competence and social acceptance for young children that assesses four domains: cognitive competence, physical competence, peer acceptance, and maternal acceptance.
Cooper Farran Behavioral Rating Scales (Cooper & Farran, 1988)	Assesses the classroom behavior of students as it relates to interpersonal skills and work-related skills. Teachers provide information on student's performance on each of 39 dimensions.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1986)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.

(continued)

Table 4.10 (continued)

Description of Tests Administered for Jordan Intensity Study

MEASURES	DESCRIPTION
Comprehensive Evaluation of Family Functioning (CEFF) (McLinden, 1989)	Assesses areas in which a family having a child with special needs may be affected. Areas assessed are: time demands, acceptance, coping, social relationships, financial demands, well-being, and sibling relationships.
Parent Self-Awareness Scale (PSAS) (Snyder, Weildreyer, Dunst, & Cooper, 1985)	Assesses parent perceptions of empowerment in the areas of decision making, obtaining information, and in interactions with self and others.
Holmes & Rahe Major Life Events (Holmes & Rahe, 1967)	Assesses parent stress resulting from major life events that occurred within the past year.

Recruitment, training, and monitoring of diagnosticians. Diagnosticians who were recruited for the study successfully completed certification procedures required for the Battelle Developmental Inventory at Pretest, Posttest #1 and Posttest #2, and for the Woodcock Johnson and Scales of Independent Behavior at Posttest #3. Testers were recruited through the Early Intervention Research Institute at Utah State University. Only testers who were "blind" as to the group membership of children participating in the study were recruited. All diagnosticians had a minimum of a Bachelor's Degree and experience working with young children with disabilities. Certification included an extensive inservice on BDI, Woodcock Johnson and SIB administration and scoring. Prior to collecting data for the study, each examiner was required to administer a minimum of three assessments, two of which were observed for quality control. Further, each examiner was "shadow scored" for reliability at least once during each test period. For Posttest #1, an average of 9% of all tests were "shadow scored" for interrater reliability. Average agreement was 90% and ranged from 77 to 100%. Eleven percent of all tests were shadow scored for Posttest #2, and average agreement was 91% with a range of 84 to 97%. Posttest #3 resulted in average agreement equal to 96% for the Woodcock-Johnson, with the range from 87% to 100% and averaged 98% for the SIB, with a range of 94% to 100%.

For Posttest #1, Josephs were administered by a graduate student in the School Psychology Program at the University of Utah. The site coordinator provided training on the Joseph prior to the first administration. Children were administered the Joseph during their school day. Posttest #2 Josephs and Posttest #3 Harters were administered by the same diagnosticians who gave the Battelle and Woodcock-Johnson, respectively. Each examiner received training in the Self-Concept measure from the site coordinator and the assessment coordinator prior to administration.

Pretest. Pretest data were collected at the beginning of the academic year. Parents and subjects completed a core pretest battery of assessment measures that were common across sites, including the Battelle Developmental Inventory (BDI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Scales (FACES III). Family functioning has been an overlooked variable in early intervention research (Casto & Mastropieri, 1986; Dunst, 1986). Although theoretically, it is assumed early intervention will affect families (Bronfenbrenner, 1979), the specific areas that may be impacted are unknown and may vary depending on the type of intervention. The battery of family functioning measures used here will help to elucidate areas of functioning that may be affected by different intensities of intervention. Parents also provided demographic information at pretest. More information on these measures can be found in Table 4.10 and in the Final Report of the Longitudinal Studies of the Effects of Costs of Early Intervention for Handicapped Children (White, 1991).

Posttest #1. All 53 children in the study were administered their first posttest at the end of the first academic year (May and June). Measures administered were shown earlier in Table 4.9. In addition, parents also provided information on aspects of treatment verification such as ratings of satisfaction with the intervention program.

Posttest #2. The second posttesting was completed in June, 1990. The measures described earlier were administered to all 53 children who completed intervention.

Posttest #3. Posttest #3 assessment was completed for 53 children as of June 1991. At Posttest #3, the mean age of children in the study was 81 months. Several children in the study were approaching the upperbound of the age limit for the BDI, so the Woodcock Johnson (W-J) and Scales of Independent Behavior (SIB) were administered to all children in the study for Posttest #3 instead of the Battelle Developmental Inventory. The SPECS was administered to teachers and parents as in the previous two posttests. At this posttest, changes were made in some of the family measures as well. The PSI and FACES were dropped, although the FRS and FSS were completed by parents. In addition, the Social Systems Rating Scale (SSRS), Parent Self-Awareness Scale (PSAS), Comprehensive Evaluation of Family Function (CEFF), and the Holmes and Rahe were given to parents of subjects in the study. At Posttest #3, the Harter Measure of Self-Concept was used in place of the Joseph.

Results and Discussion

Thus far, data have been collected one, two, and three years after the intervention was initiated. Children participated in the different intensities of intervention for only one year. Table 4.11 shows this difference for the 1988-89 school year. The table also outlines educational placement for the children in the

Table 4.11

Early Intervention and Education Services by Group

	Less Intensive			More Intensive		
	3 days per week	5 days per week		3 days per week	5 days per week	
1988-89	28	0		0	25	
	Preschool Intervention	School Intervention	No Educational Services	Preschool Intervention	School Intervention	No Educational Services
1989-90	9	19	0	9	15	1
1990-91	0	27	1	0	25	0

two groups at Posttests #2 and #3. Most of the children remain in the Jordan School District service area. More detail on educational placement is given in the educational placement and cost section, which is presented later in this report.

The results of Posttest #1 represent an immediate test of the effects of the different intensity of services provided to children in the study. Posttests #2 and #3 are a follow-up to the intensity question and will provide information regarding whether differences between groups appear some time after treatment and whether initial differences are maintained through time. First, the comparability of groups at pretest will be presented. The results of the posttest child functioning analysis follow and then the results of the posttest family measures are presented. Finally, educational placement and cost results are outlined.

Comparability of Groups on Pretest Measures

The comparability of groups on demographic characteristics was presented in Table 4.3 and discussed earlier. A difference was observed for 4 of 17 variables in those comparisons. Group differences on family and child pretest measures are presented in Table 4.12. Using the same cut-off value for assessing statistical significance as in the demographic analysis ($p \leq .10$), subjects were comparable on all BDI domains, on the BDI Total score, and for chronological age at pretest. This is supported by the average ES across child and family measures, which equals -.03. On measures of parent and family functioning, statistically significant group differences were found only on the FACES measure of cohesion. Parents of subjects in the less intensive group indicated a stronger connection of individual family members to the family than the more intensive group. For all other measures of family functioning, including the measures that would suggest differences in the areas of family stress, family resources, family structure, and available family support systems, the two groups were not statistically significantly different when

Table 4.12

Comparability of Groups on Pretest Measures for Jordan Intensity Site

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[&]
• Age in months at pretest	50.0	6.8	28	50.3	6.3	25	.88	.04
• Battelle Developmental Inventory (BDI)[*]								
Personal Social	98.4	(22.2)	28	97.2	(19.6)	25	.84	-.05
Adaptive Behavior	65.1	(14.9)	28	68.1	(10.0)	25	.40	.20
Motor	92.6	(18.6)	28	95.8	(14.1)	25	.49	.17
Communication	48.3	(12.4)	28	47.4	(9.4)	25	.78	-.07
Cognitive	39.6	(10.5)	28	39.9	(10.1)	25	.91	.03
TOTAL	344.0	(64.5)	28	348.4	(48.1)	25	.78	.07
• Parenting Stress Index (PSI)[**]								
Total (range 101 to 504)	237.5	29.9	28	233.7	55.4	25	.75	.13
Child Related (range 54 to 270)	112.5	17.9	28	114.6	30.3	25	.78	-.12
Other Related (range 101 to 504)	125.0	19.1	28	119.1	30.1	25	.39	.31
• Family Adaptation and Cohesion Evaluation Scales (FACES)[+]								
Adaptation (range 10 to 50)	24.5	4.7	28	26.1	4.6	24	.21	.34
Cohesion (range 10 to 50)	39.0	4.3	28	41.8	5.0	24	.03	.65
• Family Resource Scale (FRS)[^] (range 30 to 150)	116.1	15.3	28	122.8	20.2	25	.18	.44
• Family Support Scale (FSS)[^] Total Score (range 0 to 4)	2.1	.7	28	2.1	.7	25	.99	.0
• Family Index of Life Events (FILE)[**] (range 0 to 71)	9.8	5.1	28	11.4	7.9	25	.40	-.31

[*] Statistical analysis for BDI scores was conducted using raw scores for each of the scales.

[+] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

[^] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources reported as being available. Higher scores are considered better. For the FSS, the score presented represents the sum of perceived support divided by the number of reported sources.

[**] The PSI and FILE are based on raw scores where lower scores are considered better.

[&] Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, and FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

they entered the study. Overall, these data suggest that the groups were comparable on child and family functioning measures at pretest.

Analysis of Family and Child Functioning For Posttests #1, #2, and #3

Effects for the measures of family and child functioning were obtained using an analysis of covariance procedure completed on SPSS-PC. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis.

All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. For example, BDI pretest personal/social score and number of siblings living at home were used as covariates for 12-month Battelle Personal/Social raw scores. The combination of these variables reduced the amount of unexplained variance in the 12-month Battelle Personal/Social raw scores better than other combinations of pretest and demographic variables. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $p \leq .10$, and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977), in those cases where a covariate or set of covariates could be found which correlated with the dependent variable in question at least .70 (which was almost the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 97% for finding moderate sized differences (defined by Cohen as differences of a half a standard deviation).

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Posttest #1. Twenty-three child functioning variables were examined and are presented in Table 4.13. Nine of the child functioning measures were statistically significant ($p \leq .10$). Seven of the nine significant measures favored the more intensive group and three of these measured sensorimotor development. The BDI cognitive and total scores also favored the experimental subjects as did the Teacher ratings of general and physical development. However, parent ratings of general development favored the less intensive group, which contradicts some of the teacher ratings and BDI scores. It should be noted that parents' ratings were not "blind", but one would have expected any parental bias to be in favor of the more intensive group.

The CFBRS measure of Interpersonal Skills demonstrated statistically significantly better personal/social skills for subjects in the less intensive group as demonstrated in classroom situations. The CFBRS finding in the area of interpersonal skills is not reflected by the BDI personal/social domain. This may have occurred because the teacher completed the CFBRS, whereas the parent reported on personal/social skills for the BDI. However, parents rated children in the more intensive program more negatively on subscales of the PODS that are most closely related to the BDI personal/social subscale.

Table 4.13

Posttest #1 Results of Child Functioning for Jordan Intensity Study

		Less Intensive				More Intensive						
Variable*	Covariates+	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	P Value	ES^
Average length of intervention in days	---	109.	2.5	--	28	178	11.4	--	25	977.5	.00	27.6
Average length of intervention in months	---	9	00	--	28	8.88	.60	--	25	1.12	.29	.0
Age in months at posttest	---	57	6.8	--	29	57	7.9	--	25	0.10	.75	.0
Battelle Developmental Inventory												
Personal Social	1,19	110.4	(27.0)	111.2	28	114.4	(22.7)	113.6	25	.34	.56	.09
Adaptive Behavior	2	72.4	(14.9)	73.7	28	76.7	(9.8)	75.4	25	.93	.34	.11
Motor	3,20	98.5	(20.1)	99.9	28	106.4	(18.1)	104.9	25	5.32	.03	.25
Communication	4	54.6	(16.0)	54.1	28	54.4	(13.1)	54.9	25	.11	.74	.05
Cognitive	5	44.9	(12.2)	45.0	28	48.4	(11.8)	48.3	25	3.88	.05	.27
TOTAL	6	380.6	(73.0)	383.0	28	400.3	(57.9)	397.9	25	4.85	.03	.20
Joseph TOTAL	4	17.3	(3.1)	17.3	28	18.2	(5.3)	18.3	24	.90	.35	.32
Cooper-Farran Behavior Rating Scale (CFBRS)												
IPS	1,9,24	5.5	(.6)	5.4	23	4.9	(.8)	5.0	20	3.34	.08	-.67
WRS	6	3.8	(1.0)	3.9	28	3.8	(1.0)	3.8	23	.04	.85	-.10
Perceptions of Dev. Status (PODS) by Teacher												
General Development	6,25	2.9	(.9)	2.9	28	3.2	(.6)	3.2	23	5.40	.03	.33
Communication	5,2	3.2	(.7)	3.2	28	3.3	(.6)	3.3	25	.81	.37	.14
Sensorimotor	3	3.9	(.6)	4.0	28	4.4	(.4)	4.3	25	15.74	.00	.50
Physical	3,25	3.9	(1.0)	3.9	28	4.2	(.6)	4.2	23	4.94	.03	.30
Self Regulation	6,25	3.5	(.9)	3.5	28	3.6	(1.0)	3.6	23	.39	.54	.11
Cognition	5,11	2.7	(1.0)	2.7	28	3.0	(.8)	3.0	25	1.79	.19	.30
Self-Social	6	3.2	(1.0)	3.2	28	3.5	(.8)	3.5	25	2.03	.16	.30
Parent PODS												
General Development	6,16	3.6	(.8)	3.6	28	3.3	(.7)	3.2	24	3.16	.08	-.50
Communication	1,12,18,20	3.6	(.6)	3.5	28	3.6	(.7)	3.7	24	2.36	.13	.33
Sensorimotor	3,26	4.1	(.5)	4.2	28	4.4	(.4)	4.4	23	7.18	.01	.40
Physical	2,14	4.3	(.5)	4.4	28	4.4	(.5)	4.3	24	.11	.74	-.20
Self Regulation	1,9	4.0	(.6)	4.0	28	3.9	(.8)	3.9	24	.33	.57	-.17
Cognition	1,9	3.6	(.8)	3.6	28	3.5	(.8)	3.5	24	.11	.75	-.13
Self-Social	6	3.9	(.5)	3.9	28	3.8	(.8)	3.7	24	.83	.37	-.40

* Statistical Analysis for assessment instruments was conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

+ Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home, 20 = Income, 21 = Father's Age, 22 = Age at Pretest, 23 = FACES Discrepancy, 24 = Marital Status of Father, 25 = Father's Occupation, 26 = Mother's Age.

The results from the first year posttest are inconclusive. While the majority of the effect sizes (16 of 23) are positive and favor the more intensive group, it is noteworthy that 30% are negative. Seven of the 9 statistically significant differences favor the more intensive group, but the average overall effect size for measures of child development is only .08. Furthermore, the area which most consistently favored the high intensity group (sensorimotor), was not a primary emphasis of the intervention program. Given the addition of substantially more communication therapy time for the more intensive group, differences in the communication area would have been more likely. Thus, although there is some evidence from the first posttest that the more intensive program may have resulted in better developmental progress for participating children, that evidence is thin and not particularly compelling.

Posttest #2. Examination of the same measures of child functioning as evaluated for posttest 1 reveals that fewer differences existed one year later. The p values, presented in Table 4.14, at $p \leq .10$ suggest only two differences between the subjects in the two different levels of intensity. The Cooper-Farran Behavior Rating Scale (CFBRS) measure of Interpersonal Social Skills and the Parents' Perceptions of "Self-Social" Developmental Status were statistically significant in favor of the less intensive group.

None of the differences which favored the more intensive group at Posttest #1 were maintained for the same measures at Posttest #2. The BDI motor, BDI cognitive, BDI Total, and teacher and parent SPECS sensorimotor differences measured at Posttest #1 have disappeared. The teacher completed CFBRS measure of Interpersonal Skills provided evidence that the less intensive group still had better personal-social skills in the classroom, although they did not have better work-related skills.

These results raise further questions about the degree to which Posttest #1 results suggests that a more intensive program of this nature will result in better

Table 4.14

Posttest #2 Measures of Child Functioning for the Jordan Intensity Study

		Less Intensive				More Intensive						
Variables	Covariates+	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES^
Average length of intervention in days	----	109.0	(2.5)	---	28	178.0	(11.4)	---	25	977.5	.0	27.6
Average length of intervention in months	----	9.0	(0.0)	---	28	8.8	(.6)	---	25	1.1	.29	.0
Age in months at posttest	----	68.9	(6.9)	---	28	69.8	(6.7)	---	25	1.1	.62	.13
Battelle Developmental Inventory												
Personal/Social	1,20	133.2	(28.6)	131.4	28	131.0	(23.3)	132.8	25	.08	.78	.05
Adaptive Behavior	2,21	84.0	(16.2)	85.6	26	83.7	(13.1)	82.1	23	1.14	.29	-.22
Motor	3,22	113.6	(28.4)	116.0	28	122.0	(21.4)	119.6	25	1.49	.23	.13
Communication	4,23	66.2	(18.6)	64.8	28	63.7	(13.3)	65.1	23	.01	.92	.02
Cognitive	5,20	61.1	(23.2)	60.6	28	58.3	(16.1)	58.9	25	.25	.62	-.07
TOTAL	6	458.1	(99.0)	460.9	28	460.5	(69.2)	457.7	25	.07	.79	-.03
Joseph TOTAL	6,24	23.1	(6.0)	23.0	28	21.7	(5.5)	21.9	23	.69	.41	-.18
Cooper-Farran Behavior Rating Scale (CFBRS)												
IPS	6	52.1	(10.7)	52.2	28	46.1	(14.5)	46.0	23	4.05	.05	-.58
WRS	6	37.3	(12.0)	37.5	28	37.7	(12.6)	37.5	23	.00	.98	.00
Perceptions of Develop. Status by Teacher												
Communication	5,23	6.5	(1.6)	6.4	28	6.3	(1.4)	6.5	21	.06	.81	.06
Sensorimotor	3	16.1	(2.2)	16.2	28	16.8	(2.2)	16.7	23	1.12	.30	.23
Physical	3,19	12.5	(2.1)	12.8	28	12.9	(2.2)	12.6	23	.17	.68	-.10
Self Regulation	23	15.1	(3.3)	14.9	28	14.0	(4.1)	14.3	21	.33	.57	-.18
Cognition	5,23	6.0	(2.5)	5.9	28	6.1	(1.9)	6.2	21	.41	.53	.12
Self-Social	6,24	13.1	(3.9)	12.9	28	13.7	(4.1)	13.9	23	1.33	.26	.26
Perceptions of Develop. Status by Parent												
Communication	5,27	7.5	(1.6)	7.4	28	6.7	(1.2)	6.8	23	2.72	.11	-.38
Sensorimotor	3	17.6	(2.0)	17.8	28	17.9	(1.4)	17.8	24	.01	.94	.00
Physical	3,21,25	13.3	(1.1)	13.3	27	13.4	(1.4)	13.4	23	.27	.61	.09
Self Regulation	27,14	16.1	(2.6)	16.1	28	15.1	(2.7)	15.2	24	1.54	.22	-.35
Cognition	5,27,24,23	7.8	(1.6)	7.4	28	7.0	(1.8)	7.3	22	.02	.89	-.06
Self-Social	6,26	16.1	(2.2)	16.3	27	15.2	(3.2)	15.1	20	3.94	.05	-.55

* Statistical Analysis for assessment instruments was conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

+ Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers years of Education, 19 = Number of Siblings Living at Home, 20 = Gender, 21 = Highest Degree Completed by Father, 22 = School, 23 = Adults in home attending school, 24 = Hours in Daycare, 25 = Income, 26 = Hours Worked by Father, 27 = FACES Perceived.

child developmental progress. The average effect size across all measures at Posttest #2 is -.08 (in favor of the less intensive group). Of course, one would expect the posttest immediately following the intervention to show stronger results, and it would not be surprising if those results faded somewhat over time. However, the small magnitude of the differences and the inconsistency of results suggests that any benefits attributable to the more intensive intervention are weak, at best.

Posttest #3. Of the 28 measures of child functioning presented in Table 4.15, the more intensive group scored higher on 22, and the less intensive group scored higher on 6. Five scores showed statistically significant differences ($p \le .10$) between the groups. Of these, four favored the more intensive group (the teacher SPECS sensorimotor score, the Scales of Independent Behavior motor skills, personal living skills, and total score) and one favored the less intensive group (the parent evaluation of problem behaviors from the SSRS). The SIB motor skills result was consistent with the Teacher SPECS sensorimotor score ($p \le .01$), but contradicted the Parent SPECS, which showed no difference between the groups. Interestingly, the teacher evaluation of problem behaviors on the SSRS did not indicate significant differences between the groups, whereas the parent evaluation did. The average effect size across all measures was .14. As in the first year, these results suggest some advantage for the group with higher intensity, but the evidence is thin and not particularly compelling. Differences of this magnitude would move the more intensive group less than ½ of a percentage point. Even on those areas where the greatest growth was shown (i.e., those measures that were statistically significant in favor of the more intensive group at #3), the magnitude of the differences is only enough to move children in the more intensive group from just below the first percentile at the beginning of the study, to just above the first percentile at the end of the study (less than 1½ percentile points).

Summary of measures of child progress. With so many different measures of child progress administered over nearly a four-year period, it is difficult to step back and see the larger picture. Figure 4.1 summarizes all of the scores from Posttest #1 through Posttest #3 in graphical form. The various measures administered are listed down the left-hand side and the entries in the center of the figure represent effect sizes for that measure at each test (1, 2, or 3 for each respective posttest).

Table 4.15

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups at Posttest #3 in the Jordan Parent Involvement Study

		Less Intensive				More Intensive						
Variable[*]	Covariates[+]	$\bar{x}$	(SD)	Adj$\bar{x}$	n	$\bar{x}$	(SD)	Adj$\bar{x}$	n	ANCOVA F	p Value	ES[^]
• **Woodcock-Johnson Revised Achievement Raw Scores for:**												
Broad Knowledge Total	9,10,11	41.0	(13.2)	40.3	28	40.4	(9.3)	41.0	25	.11	.74	.05
Skills Knowledge Total	9,10,11	34.8	(18.6)	34.2	28	37.2	(15.2)	37.8	25	1.24	.27	.19
• **Scales of Independent Behavior**												
Motor	4,6	62.3	(15.4)	61.6	28	67.5	(12.3)	68.2	25	3.84	.06	.43
Social/Communication	4,2,8	78.0	(16.7)	78.7	28	80.6	(10.1)	79.8	25	.13	.72	.07
Personal Living	4,6	117.4	(27.9)	116.6	28	126.4	(21.1)	127.3	25	4.10	.05	.38
Community Living	4,6	47.5	(18.9)	47.2	28	49.6	(14.9)	49.9	25	.58	.45	.14
Total	4,2,6	305.2	(68.2)	303.5	28	324.1	(49.9)	325.8	25	3.66	.06	.33
• **Parent Developmental SPECS**												
Communication	1,2,6	7.4	(1.2)	7.3	27	7.3	(1.2)	7.4	25	.12	.73	.08
Sensorimotor	4,6	17.4	(2.2)	17.3	27	17.8	(1.6)	17.8	25	1.05	.31	.23
Physical	2,4,8	13.0	(1.6)	13.0	27	13.2	(1.4)	13.1	25	.04	.85	.06
Self-Regulation	1,2,6	16.2	(2.4)	16.0	27	15.2	(3.5)	15.4	25	.93	.34	-.25
Cognition	1,2,6	7.3	(1.6)	7.1	27	7.6	(1.7)	7.7	25	2.47	.12	.38
Self-Social	1,2,6	15.9	(2.8)	15.7	27	15.2	(3.1)	15.4	25	.13	.72	-.11
• **Teacher Developmental SPECS**												
Communication	1,2	6.5	(1.5)	6.4	26	8.0	(6.1)	8.0	24	1.76	.19	1.07
Sensorimotor	3	15.4	(2.2)	15.6	26	17.3	(2.0)	17.1	24	10.92	.01	.68
Physical	4,5,6	12.3	(2.0)	12.2	26	12.8	(1.8)	12.9	24	1.98	.17	.35
Self-Regulation	7,1,2	14.8	(3.2)	15.0	23	15.2	(3.3)	15.0	23	.25	.62	.13
Cognition	4,6	6.2	(1.7)	6.2	26	6.3	(1.9)	6.4	24	.16	.69	.12
Self-Social	1,6	14.2	(3.0)	14.1	26	14.8	(2.7)	14.9	24	1.32	.26	.27
• **Social Skills (SSRS)**												
Parent evaluation of social skills	1,2,8	40.0	(9.0)	40.2	25	45.1	(14.9)	44.8	25	2.01	.16	.51
Parent evaluation of problem behaviors	1,2,8	13.3	(5.0)	12.3	26	18.6	(15.1)	19.7	24	6.10	.02	-1.48
Teacher evaluation of social skills	1,2,8	30.3	(9.8)	31.1	21	32.8	(11.5)	32.0	23	.09	.77	.09
Teacher evaluation of problem behaviors	1,2,16	10.8	(7.6)	10.9	22	14.8	(8.9)	14.6	23	2.40	.13	-.49
Teacher academic comp.	4,17,8	21.2	(7.7)	21.7	22	25.2	(8.8)	24.7	23	1.49	.23	.39
• **Perceived Competence and Social Acceptance**												
Cognitive competence	14,20,12	21.5	(2.4)	21.2	22	20.5	(3.4)	20.9	23	.16	.69	-.13
Physical competence	14,20,12	20.8	(3.3)	20.4	22	19.7	(4.2)	20.2	23	.02	.89	-.06
Social acceptance by peers	14,13,12	18.7	(4.7)	18.3	22	18.5	(3.4)	18.9	23	.35	.56	.13
Social Acceptance by Mother	13,12	18.8	(4.5)	18.4	22	19.1	(4.1)	19.5	23	.82	.37	.24

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[*] 1 = Battelle Personal-Social Raw, 2 = PSI Child Stress, 3 = BDI Motor Total, 4 = BDI Total Raw, 5 = FACES Adaptability, 6 = Hours per day child in daycare, 7 = Mother's Occupation, 8 = Number of siblings in home, 9 = Sex of child, 10 = BDI Cognitive Raw, 11 = PSI Other Stress, 12 = Hours mother works per week, 16 = Ethnicity of child, 17 = PSI Total Stress, 21 = Income

[^] Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the SSRS Teacher evaluation of problem behaviors, the numerator for the ES is calculated as less intensive minus more intensive, as lower scores are preferred.

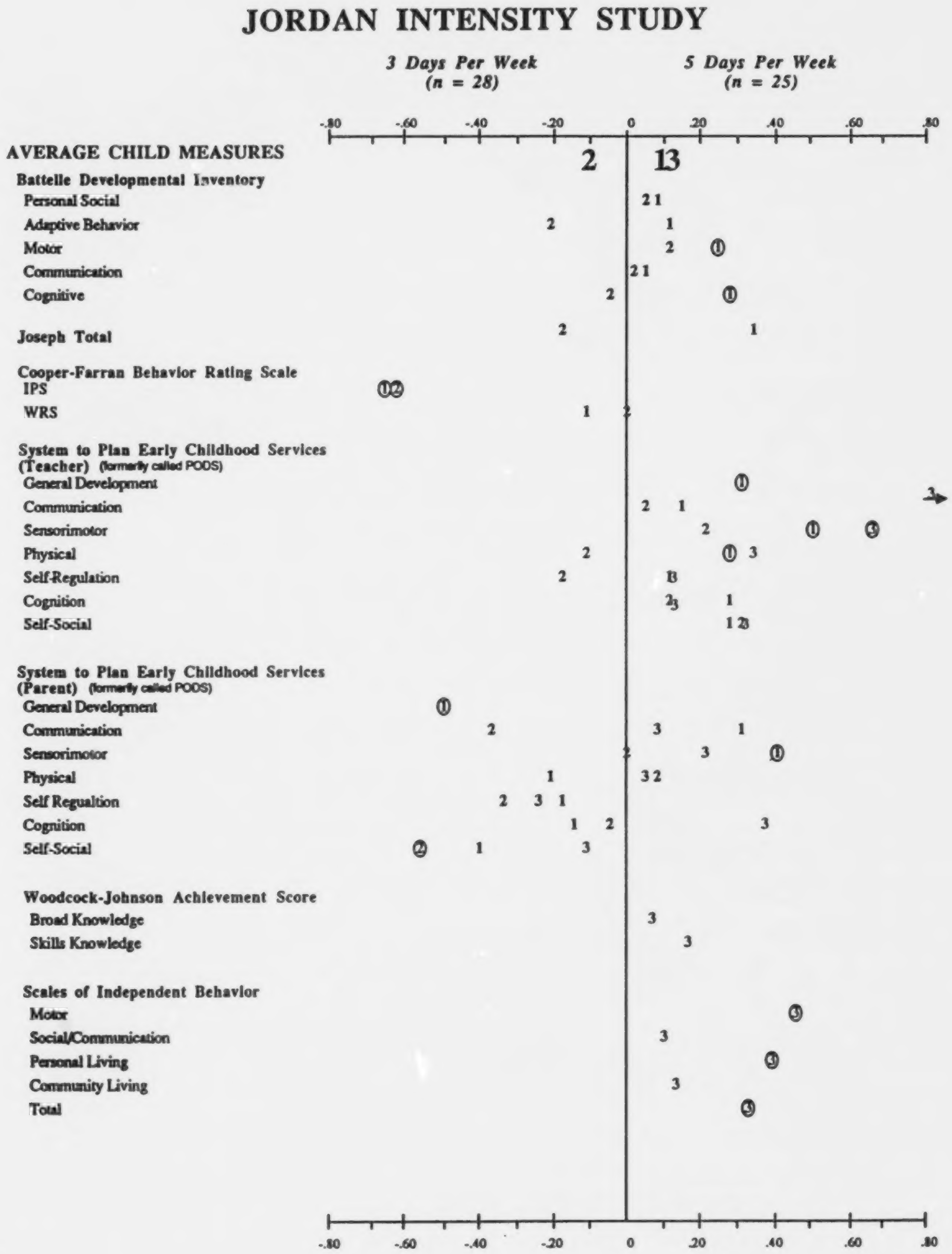

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Figure 4.1. Graphic representation of results from child and family measures for the Jordan Intensity Study.

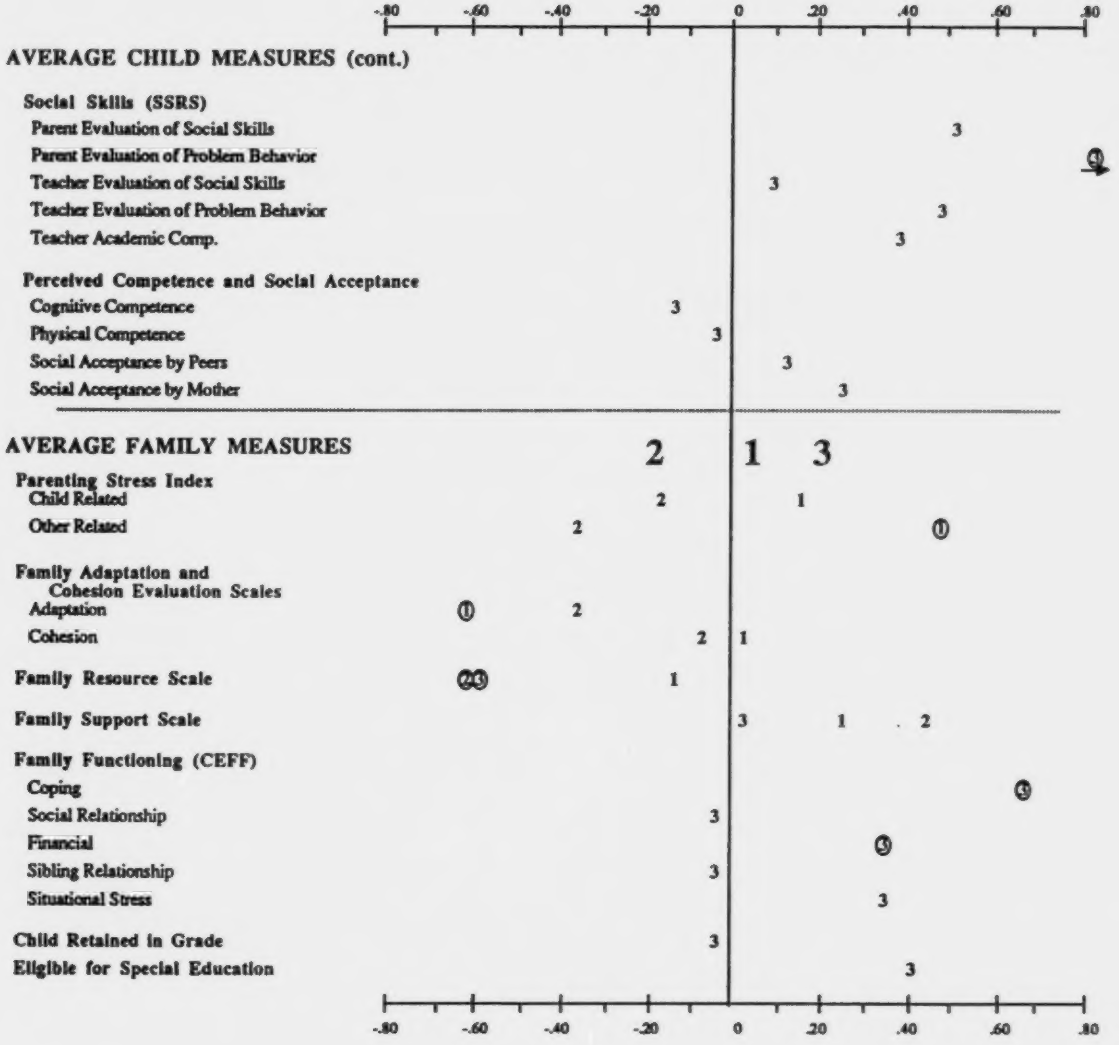

Figure 4.1. Graphic representation of results from child and family measures for the Jordan Intensity Study (continued).

All posttest scores are based on covariance adjusted means. Entries on the left side of the line indicate that the less intensive group performed better and entries on the right side of the line indicate that the more intensive group did better. Those that are statistically significant ($p \leq .10$) are circled.

As can be seen, the results suggest a very slight advantage in favor of the more intensive group, but the evidence is not very compelling. Differences are small, fluctuate from year to year, are sometimes internally inconsistent, and are often not in the areas where the greatest impact would have been expected given the emphasis of the intervention program. Nonetheless, of 16 statistically significant differences (out of 72 measures of child progress), more than twice as many favored the more intensive group (11 versus 5). Approximately half of those that favored the more intensive group were measures of motor performance, and 80% of those that favored the less intensive group were measures of interpersonal and social skills.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Posttest #1. Table 4.16 presents the effects of alternate degrees of intensity on measures of family functioning at posttest #1 from the PSI, FACES, FRS, and FSS. Two variables in this table are worthy of discussion. Parents in the less intensive group perceived higher levels of stress due to factors other than the child, than parents in the more intensive group. The FACES measure of adaptation also shows a difference between groups with the more intensive group reporting less family adaptability than those in the less intensive group ($p = .01$). The average effect size across five measures of stress, adaptation, and cohesion was .07.

Parents with higher scores on the FACES adaptability (e.g., a more positive responsiveness to life events) also reported higher levels of stress on the "Other Related" PSI score. It does seem a little inconsistent that families who adapt more effectively, also report higher levels of stress.

Table 4.16

Posttest #1 Results of Family Functioning for Jordan Intensity Study

		Less Intensive				More Intensive						
Variable	Covariates+	$\bar{x}$	(SD)	Adj$\bar{x}$	n	$\bar{x}$	(SD)	Adj$\bar{x}$	n	ANCOVA F	p Value	ES^
Parenting Stress Index (PSI)**												
Child Related (range 47 to 235)	11,19	118.4	(26.4)	117.3	28	112.0	(22.5)	113.1	25	.80	.37	.16
Other Related (range 54 to 270)	12,14	130.5	(17.4)	128.0	28	117.2	(26.1)	119.8	25	4.03	.05	.47
TOTAL (range 101 to 515)	13,19	248.9	(38.7)	245.0	28	229.2	(43.2)	233.1	25	2.52	.12	.31
Family Adaptation and Cohesion Evaluation Scales (FACES)+												
Cohesion (range 10 to 50)	8,21	40.0	(3.5)	40.9	28	42.0	(6.0)	41	25	.00	.95	.03
Adaptation (range 10 to 50	9	25.7	(4.4)	26.2	28	24.0	(4.23)	23.5	25	6.72	.01	-.61
Family Resource Scale (FRS)& (range 30 to 150)	14,16	123.0	(15.4)	124.9	28	124.7	(17.7)	122.8	23	.60	.44	-.14
Family Support Scale (FSS) Total Score by mother@ (range 0 to 4)	16	2.0	(.8)	2.0	28	2.2	(.8)	2.2	22	1.62	.21	.25

** Analyses for the PSI are based on raw scores. Lower scores are considered better.

@ Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

+ Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

& Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, and FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

+ Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home, 20 = Income, 21 = Father's Age, 22 = Age at Pretest, 23 = FACES Discrepancy.

Posttest #2. Results of Posttest #2 measures of family functioning are shown in Table 4.17. While the results show no statistically significant differences between groups on the PSI or on the FACES measures of adaptability and cohesion, the groups do differ on the Family Resource Scale and the Family Support Scale ($p \leq .10$). Again, it seems somewhat unusual that the more intensive families would score lower

Table 4.17

Posttest #2 Measures of Family Functioning for the Jordan Intensity Study

		Less Intensive				More Intensive						
Variables	Covariates[+]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES[^]
Parenting Stress Index[**] (PSI)												
Child Related (range 47 to 235)	11	110.0	(26.3)	110.7	28	115.8	(23.6)	115.1	25	.67	.42	-.17
Other Related (range 54 to 270)	12,14,8	125.6	(20.3)	120.2	28	122.0	(32.5)	127.3	24	1.7	.2	-.35
TOTAL (range 101 to 505)	13	235.6	(41.6)	233.1	28	237.7	(51.4)	240.2	24	.48	.49	-.17
Family Adaptation and[♦] Cohesion Evaluation Scales (FACES)												
Cohesion (range 10 to 50)	8	40.0	(4.1)	41.0	28	41.6	(5.7)	40.6	25	.125	.73	-.10
Adaptation (range 10 to 50)	9,14	25.6	(5.7)	26.3	28	24.9	(4.6)	24.3	25	2.27	.14	-.35
Family Resource Scale (FRS)[&] (range 30 to 150)	14	122.0	(12.8)	124.2	28	119.1	(20.7)	116.9	25	4.54	.04	-.57
Family Support Scale (FSS) Total Score by mother[@] (range 0 to 4)	16	26.5	(9.2)	26.6	27	30.6	(10.1)	30.5	22	2.97	.09	.42

[**] Analyses for the PSI is based on raw scores. Lower scores are considered better.

[@] Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

[♦] Scores for each subscale of the FACES are based on linear scoring, where high scores are preferred.

[&] Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

[^] Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

[+] Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home.

on the Family Resource Scale but higher on the Family Support Scale. Generally, one would expect these scores to be related.

Posttest #3. Table 4.18 reports the results of analysis of covariance for family functioning at Posttest #3. The FSS, unlike the Posttest #2 results, shows no significant differences between the groups, but the FRS remains significantly in favor of the less intensive group (p = .01). The results on the CEFF show statistically significant differences in favor of the more intensive group for the coping and financial scales (note that lower scores are preferred on the CEFF).

Table 4.18

Posttest #3 Measures of Family Functioning for the Jordan Intensity Study

Variable	Covariates*	Less Intensive				More Intensive				ANCOVA F	p Value	ES^
		$\bar{x}$	(SD)	Adj$\bar{x}$	n	$\bar{x}$	(SD)	Adj$\bar{x}$	n			
Family Support (FSS)												
Family Support Total	22,14	27.7	(9.3)	27.5	27	27.4	(11.5)	27.6	23	.00	.96	.01
Family Functioning (CEFF)												
Time Demands	6,4,2	12.0	(4.8)	12.5	25	13.4	(4.5)	12.9	25	.13	.72	-.08
Acceptance-Problems	8,4,2	.9	(1.4)	1.0	27	1.5	(2.4)	1.5	25	.86	.36	-.36
Coping	21,2	17.0	(4.5)	17.1	27	14.2	(5.1)	14.1	25	5.59	.02	.67
Social Relationship	16,4,2	12.8	(4.0)	13.0	27	13.3	(5.1)	13.1	24	.02	.88	-.03
Financial	16,4,2	4.5	(2.9)	4.5	27	3.5	(2.2)	3.5	24	3.05	.09	.35
Well-Being	4,2	14.0	(3.8)	14.0	27	14.3	(3.0)	14.2	25	.06	.81	-.05
Sibling Relationship	8,2	23.9	(8.3)	23.3	27	23.0	(11.3)	23.7	25	.02	.90	-.05
Situational Stress	6,4,2	19.5	(7.9)	20.3	27	18.3	(7.2)	17.5	25	2.49	.12	.35
Total CEFF	4,9,2,6	84.2	(15.4)	85.8	25	83.1	(21.4)	81.5	25	1.00	.32	.28
Family Resource Scale	23,21	128.1	(13.9)	129.8	27	124.1	(16.0)	122.4	25	6.45	.01	-.53

* 2 = PSI Child Stress, 4 = BDI Total Raw, 6 = Hours per day child in daycare, 8 = Number of siblings in home, 9 = Sex of child, 16 = Ethnicity of child, 18 = Mother's Marital Status, 19 = Mother's education, 20 = FACES Cohesion, 21 = Income, 22 = FSS Mother Total, 23 = FRS Total.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the CEFF, the ES is computed as Less Intensive minus More Intensive, as lower scores are preferred.

Summary of measures of family functioning. As with the child measures, there are enough measures of family functioning over the three years that the results are difficult to synthesize. A graphical summary which depicts the results across all three years was shown earlier in Figure 4.1. Since family support and assistance were not primary objectives of this program, the primary reason for measuring family functioning was to determine whether the Family Support Scale and Family Resource Scale are less direct tests of this hypothesis than the measures of stress, adaptation and cohesion. The 19 measures of family functioning (i.e., PSI, FACES, and CEFF) over the 3 years showed 4 statistically significant differences (3 in favor of the more intensive group and 1 in favor of the less intensive group). The average effect size across these measures was .02. Taken together, these results suggest little, if any, benefit on family functioning as a result of children's participation in the more intensive early intervention program.

Educational Placement and Cost

After all of the children were old enough to be enrolled in public school programs (5 years or older), educational placement data was gathered from teachers at Posttest #3. The results are presented in Table 4.19. No statistically significant differences between the groups are indicated on classroom placement or the other educational service variables which include grade retention and eligibility for special education services.

Table 4.19

Educational Placement of Jordan Intensity Subjects for Posttest #3
(as reported by the child's teacher)

	Less Intensive			More Intensive					
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	t Value	p Value	ES^
Child retained in grade	12%	(.33)	26	13%	(.34)	24	-.10	.92	-.03
Eligible for special education	96%	(.20)	26	88%	(.34)	24	1.1	.28	.40

^ Effect Size (ES) is defined here as the difference between the groups (low intensity minus high intensity) on the $\bar{x}$ scores divided by the standard deviation of the Less Intensive Intervention Group (Lower scores are preferred on all 3 placement variables) (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

Another issue related to educational placement of subjects in the study is whether educational service cost differences exist. While the differences in educational placement are not statistically significant, there are differences in service. How do these differences translate into dollar cost to the school system, and ultimately to taxpayers? As shown in Table 4.20, more children from the more intensive early intervention program received regular education services for most of the day while fewer of the less intensive subjects were in self-contained placement for a full day. The cost of special education services is estimated at more than double that of non-special education placement and the more time spent in self-contained placement the higher the cost, all other things equal (Kakalik et al., 1981; Moore & Steele, 1988).

To estimate the cost of educational services for children at Posttest #3, the information on placement that was provided by the subjects' teachers was combined

Table 4.20

Posttest #3 Educational Placement and Cost Data

	Average Cost Per Student	Less Intensive		More Intensive	
		# of Subjects	% of Subjects	# of Subjects	% of Subjects
Full-Day Regular Education	$3,383	1	3.8	3	12.5
Resource Room	$6,360	9	34.6	5	20.8
50% Self-Contained, 50% Regular Education	$7,607	4	15.4	2	8.3
100% Self-Contained	$9,378	12	46.2	14	58.4
TOTAL		26	100.0	24	100.0

with average cost data from a national study of special education cost that was funded by the U.S. Department of Education (Moore & Steele, 1988). Table 4.20 summarizes the placement of children from teacher report for each child and the average cost of each placement as extrapolated from the Moore study. Moore et al. estimated the cost of resource room, self-contained, and preschool special education placements by surveying 60 school districts in 18 states. The costs of special education services were estimated during the 1985-86 school year using an ingredients approach similar to that described earlier in the cost section of this report. The 1985-86 figures of Moore et al. were adjusted for inflation using the fixed weighted price index for state and local government purchases so that the figures presented in the table are in 1990 dollars.

While there were some differences in placement of children in the study, this did not translate into large differences in average cost of current educational services for children in the two groups. The estimated average cost for one year of education for the less intensive group is $7,830 per pupil, while the average for children in the more intensive group is $7,852.

When interpreting these results, it is important to note several aspects of the computation of educational cost. First, estimates from a national study were applied to children who, in all but two cases, resided and attended school in Utah. Second, estimates for self-contained full-day vs. self-contained half-day had to be extrapolated from the Moore et al. report since they only reported cost for 78% of classroom time in self-contained. Third, although educational placement is generally based on need, there are exceptions. In this study, one subject qualified for special education services, but his family refused to enroll him. Another child in the study was enrolled in a regular education classroom at the parents' insistence although the teacher felt that the appropriate placement was a self-contained classroom. Because the parents insisted on regular education, that was the placement and the cost assigned. Placement data was not returned by one teacher of a child in the study. Fourth, costs were estimated solely on the placement data. A more precise estimate would have been possible if more data had been available regarding child-specific information about staff:child ratios, therapies, differences in special transportation, etc. Finally, not all benefits to children, families, and society can be measured in dollars. The cost of education reported here does not reflect possible benefits from child developmental differences which may not be reflected in school placement.

Keeping these limitations in mind, it is still important to note that there are not yet any long-term savings evident as a result of having enrolled children in a more intensive and consequently more expensive, early intervention program. These findings are different from the typical assumption that spending more money on early intervention will result in greater savings later. It is still possible however that such savings will become evident as children progress through school. Obviously, placements of children will continue to change, grade retention data will become available, and other benefits will become measurable in pecuniary terms. Such changes could dramatically change the cost figures presented here.

Conclusions

This study examined whether a "more intensive" center-based early intervention program compared to a "less intensive" program would result in demonstrable benefits for participating children and their families. Intensity was operationalized according to several different variables. The more intensive program provided services to children 10 hours per week (versus 6 hours per week for the less intensive program); the more intensive program had a 3 to 1 child:teacher ratio (whereas, the less intensive program had a 5 to 1 child:teacher ratio); and 5 times as much language therapy was available to children in the more intensive group as compared to the less intensive group. Other than these variables, the two intervention programs were organized similarly (e.g., curricula used, teaching styles, organizational structure, etc.) Indeed, the same teachers taught some children in each group so that quality or style of teaching would not be a confounding factor.

Obviously, intensity can be defined in a variety of different ways (e.g., duration of intervention, hours per week of intervention, percent engaged learning time, amount of one-on-one versus group interaction, etc.) However, based on previous research, it was clear that the variables selected to define "intensity" in this study were among those most frequently thought of as contributing to "more intense" interventions. Furthermore, the treatment verification data collected as a part of this study, demonstrated that children in the more intensive group did indeed receive more hours of intervention per week, were "engaged in learning" a similar percentage of time they attended (resulting in more total hours per week of engaged learning time), participated in a higher percentage of individualized and small group activities, had lower child:teacher ratios, and received more one-on-one language therapy.

The hypothesis on which the study was based was that children participating in the more intensive intervention would show greater developmental gains, and their families would benefit in terms of reduced stress and enhanced family functioning. This hypothesis was based on the conclusions of previous reviewers of the early intervention literature that more intensive early intervention programs were more beneficial, as well as the widespread perceptions of practitioners, administrators, and policymakers that more intensive early intervention programs will not only be beneficial for participating children and families but will result in long-term cost savings. The position is a logical one based on what we know about prevention in many different areas. Unfortunately, there is very little data from methodologically sound studies to confirm or refute the hypothesis that more intensive early intervention programs will be more beneficial. Consequently, this study was designed to ensure that the definition of intensity used was relevant to the types of programming options available to administrators, that the study was methodologically well-designed, and that information was collected to document that the interventions were implemented as intended (i.e., one substantially more intensive than the other.)

The results after three years are surprising. Although there is some evidence that the more intensive program resulted in small benefits in some areas for participating children, the effects are small, inconsistent, and not in the areas most expected. The average effect size over three years for measures of child progress was .05 standard deviation units. Sixteen of 72 measures of child progress were statistically significant ($p \leq .10$), with 11 of those favoring the more intensive group and 5 favoring the less intensive group. The area most frequently showing benefits for the more intensive group was motor development, and the area most frequently showing benefits for the less intensive group was the measures of appropriate behavior. Although twice as many measures demonstrated statistically significant benefits for the more intensive group as for the less intensive group, it should be remembered that almost 80% of the measures showed no statistically significant benefit for either group and the average effect size across all measures of child development was only .05.

For the family measures, there is even less evidence of benefits associated with the more intensive program. This is not surprising, since it was only expected that there would be indirect effects on family functioning. The average effect size across measures of family functioning (e.g., stress, adaptation, and cohesion) was only .02, 9 of the 19 measures favored the more intensive group, while 11 of the 19 favored the less intensive group.

The fact that the more intensive program cost about $2,500 more per child per year (approximately 75% more) than the less intensive program for such weak, inconsistent, and fluctuating gains raises additional questions. It is often suggested that the initial investment in early intervention will more than be repaid in later years because fewer special education services will be needed. Given the data from the earliest years of these children's educational experience, that is not the case in this study. Of course, those data may change as the children continue in school. At the present time, these data suggest that the substantial additional costs of increasing the intensity of early intervention programs along the lines done in this study, is not a wise investment. That same amount of money would probably be better spent by providing early intervention services to 75% more children.

In interpreting the results of this study, several points are important to keep in mind. First, this study was particularly well-done from a methodological perspective. Children were randomly assigned to groups; there was extensive documentation regarding the comparability of those groups prior to the implementation of the treatment; diagnosticians for most measures were uninformed about the purposes of the research or the group membership of children; there was extensive verification that the treatment was implemented as planned, contextual variables that might have contaminated the experimental design or affected the results were documented, and a broad set of child and family functioning measures were collected. Given these factors, the results of this study must be taken seriously.

At the same time, the results from this study should not be accepted unconditionally or prematurely to make policy decisions. Instead, the results of this study need to be replicated before they are accepted as something more than sampling fluctuation. Such replications need to be done by independent investigators using similarly rigorous techniques.

Second, even though it is important to note that the alternative levels of intensity in this study are substantially different, perhaps they were not different enough. The one study in the literature with children who were handicapped, which found substantial differences attributable to different levels of intensity, was done by Lovass with a group of autistic children. In that study, the more intensive program consisted of 40 hours per week of one-to-one programming. In this study, the more intensive program consisted of 10 hours per week of primarily group programming. Thus, it is possible that a certain "threshold" of intensity must be achieved before benefits become apparent. However, it should be remembered that the levels of intensity investigated in this study are typical of the "upper-end" of intensities currently available to most program administrators given current resources. Thus, even though it is important to determine whether even higher levels of intensity would result in demonstrable benefits, the feasibility of implementing those higher levels must be considered as research is designed.

Third, it is clear that the way in which intensity was defined in this study accounted for only a few of the many different variables which are included in the general construct of "intensity." Perhaps other ways of "intensifying" programs would have lead to different results. Those questions must still be addressed and the results of this study should not be interpreted to suggest that the entire construct of intensity has been evaluated. Still, the variables of hours of engaged learning time per week, child:teacher ratios, and availability of one-on-one related services are among the most frequently noted dimensions when people discuss the construct of intensity.

As noted in the previous points, there are a number of good reasons why we should be cautious in concluding from these results that there will be little or no benefits for children and families if substantially more intensive early intervention programs are offered. As one study, this information makes an important contribution to our knowledge concerning the effects of more intensive early intervention programs, but it is only one study. More research is needed before we will adequately understand the relationship between intensity of intervention and progress made by participating children and families. The worst use of these results would be a simple-minded knee-jerk reaction which concludes that more intensive programs are not beneficial. Instead, these results strongly suggest the need for replication, and systematic extensions in which different types of intensity are tested and the "threshold" hypothesis is more closely examined.

Each year the federal government spends billions of dollars on early intervention programs for children who are disabled, disadvantaged or at-risk. State and local governments spend additional money equal to several times that amount. The results of this study suggest that we should be cautious about concluding that more is necessarily better. More importantly, however, these results emphasize the need to immediately begin devoting substantial resources to conducting additional well-designed research studies to determine what type of intervention programs are best for which children. Because there will always be a finite amount of resources to fund early intervention, it is particularly important to evaluate the effects of those variables most closely related to costs. Intensity is one such issue. The results of this study add substantially to our knowledge about the effects of varying intensity, but much more research is needed.

SALT LAKE MEDICALLY FRAGILE STUDY

Project #5

COMPARISON: Grades I, II, III, and IV Intraventricular Hemorrhage Infants (IVH) --Services begun at 3 months adjusted age vs. services begun at 18 months adjusted age.

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EIRI COORDINATOR: Glenna Boyce

LOCATION: Salt Lake City, Utah

DATE OF REPORT: 11-12-1991

Rationale for the Study

Conventional wisdom suggests that the earlier interventions are initiated with children who have, or who are at risk for developing, disabilities, the greater will be the positive effects of those interventions. White et al. (1985-86) reported that 18 of 24 reviewers of early intervention literature indicated that earlier intervention was more effective than later intervention. In a meta-analysis of 74 studies of early intervention with children with disabilities from birth to five years of age, however, Casto and Mastropieri (1986) concluded that there was little evidence to support the "conventional" wisdom that earlier was better.

An important question related to the age-at-start issue which needs further clarification is the age at which intervention should start for infants who have serious medical problems and who routinely spend up to three months in intensive care units. Because infants who experienced intraventricular hemorrhage (IVH) in the neonatal period have been identified as a population at risk for developing subsequent disabilities, this study compared the effects of intervention initiated "early" with the effects of intervention initiated "later" in the lives of medically-compromised young infants with IVH.

Review of Related Research

Given that IVH infants comprise a subject population which is at extreme risk for experiencing neonatal complications associated with developmental dysfunctions (e.g., severe asphyxia, intrauterine growth retardation, neonatal meningitis, encephalitis, seizures, bronchopulmonary dysplasia, respiratory distress syndrome, apnea, and vision and hearing problems), it was deemed important to determine if interventions beginning early in life could prevent the development of later disabilities in IVH infants and reduce the levels of stress experienced by the families of these infants.

The National Center for Health Statistics (1989) reports that 6.8% of all live births in 1986 were of infants weighing less than 2500 g; infants weighing less than 1500 g accounted for 1.2% of live births. Approximately 40% of low birthweight infants (LBW) experience IVH (Bowerman, Donne, Silverman, & Joffe, 1984).

An estimated 50-60% of infants who suffer IVH survive (Volpe, 1981); however, information on the future developmental progress in this population is limited and controversial (Hynd et al., 1984). Sostek et al. (1987) found that although level of Grade I or II vs. Grade III or IV IVH was not related to Bayley mental and motor scores at two years of age as a group, 40% of the children suffering IVH showed severe delays. At older ages, the findings are somewhat equivocal. For example, Williamson et al. (1982) found that 29% of IVH Grade I and II LBW infants exhibited moderate disabilities by the age of 3; whereas Papile et al. (1983) found that only 15% of such children could be diagnosed as having these disabilities. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe disabilities by the third year of life. Bozynski et al. (1984) suggested that neonatal IVH typically resulted in motor rather than mental impairment, particularly in survivors of Grade IV hemorrhage.

Recent early intervention literature has described various ages at which interventions with low birthweight infants began and has reported conflicting results. Reviews of this literature (Ramey, 1984, Bennett, 1987, Casto et al., 1987, & Sandall, 1990) have continuously concluded that various types of interventions seem to have been effective. However, most of the studies included in the reviews excluded children with conditions such as IVH, and none addressed the issue of the age at which interventions should start, as the present study did. Resnick et al. (1988) did include infants with IVH and other complications and reported that a combination of in-hospital multi-modal intervention and home-based developmental intervention during the first 12 months of life resulted in significant gains in child mental development and in the quality of parent-child interactions.

More recently, the Infant Health and Development program (1990), a multisite, randomized study, compared the effects of an intensive, educationally-focused, early intervention program which included a family support and a pediatric follow-up component to a pediatric follow-up only program. Results of this study indicated that children who received the intensive early intervention performed the same as control group children during Years 1 and 2, but performed better on the Stanford-Binet Intelligence Scale and had fewer behavior problems at 36-months corrected age than did children who received pediatric follow-up alone. However, in infants with birthweights below 1,500 grams and IQ scores lower than 70, there were no treatment effects. In sum, the recent research findings regarding interventions begun early in life are still equivocal and support the need for further studies.

Previous to this study, IVH infants in Utah received only medical follow-up. This situation provided an opportunity to test an early versus later intervention hypothesis by offering more intense services to one group of IVH survivors.

Overview of Study

This study examined the differential effects on children who experienced IVH at birth and their families of beginning an early intervention program at 3 months corrected chronological age ([CCA] age corrected for prematurity),[1] to a comparison group who received the medical follow-up services that had been available in the past until they were 18 months of age (also corrected for prematurity). At 18 months, children in both groups received a similar home-based intervention program.

The pre-18 month intervention for the early intervention group focused on sensory motor intervention that was provided either in the home or at a center by a licensed physical therapist. The number of sessions depended on the needs of the child. The pre-18 month medical follow-up services received by the delayed group was the standard treatment available in the treatment area. This standard treatment included neonatal care at the respective hospitals and referral to the Utah State Department of Health Neonatal Follow-Up Clinic or follow-up from private physicians. Funding for these services was provided by the Utah State Department of Health, but those parents who did not access the NICU follow-up clinic paid for services themselves. No other services were associated with this project until they were 18 months of age. Parents were, however, free to access other services in the community if they desired. (Parents were queried about services they accessed during the time of the study, and these results will be reported later in this report.) After 18 months, the intervention received by both groups included developmental intervention provided by a home visitor and sensory motor intervention, if needed.

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[1] *In other words, a child who is born 4 weeks prematurely would not reach a corrected age of 12 weeks until 16 weeks after birth.*

Intervention services began with referral to the project by staff at the University of Utah and Primary Children's Medical Centers, who initially contacted the parents and referred interested parents to the site coordinator. When a child was enrolled, the children were randomly assigned to delayed or early intervention groups. Child development measures were administered to all children at 3 months adjusted age prior to treatment. Some additional measurements were completed at 6 and 12 months of age. At 18 months (adjusted age), and annually for the four subsequent years, child development and family functioning measures were administered to the children and parents.

Methods

This section presents the procedures for subject recruitment and assignment, the demographic characteristics of the groups, a description of the alternative intervention programs, a discussion of the treatment verification procedures, and cost analysis.

Subjects

A total of 58 subjects were enrolled. All of these subjects experienced low birthweight and IVH at birth, and all but 4 had gestational ages that were inappropriately early. Since then, one child died, leaving 57 children in the study.

Recruitment. Infants qualified for participation in the study if they were a patient in a Neonatal Intensive Care Unit (NICU) at either Primary Children's Hospital or University of Utah's Medical Center, if they experienced IVH, and if they resided in the catchment area for treatment. Subjects were matched on severity of hemorrhage and birthweight prior to random assignment to experimental or control groups. Severity of IVH was divided into mild (Grades I and II) and severe (Grades III and IV).

Assignment to Groups. Subjects who met the inclusion criteria were identified upon discharge from the respective NICU. Parents of eligible infants were contacted via mail by the medical center in which the infant was a patient the month prior to reaching 3 months corrected age. Infants who met the study criteria were considered for inclusion if the parents indicated a willingness to participate in either of the experimental conditions, depending upon where random assignment placed them. Infants were randomly assigned to the early intervention or delayed intervention conditions by a roll of a four-sided die after stratification by severity of IVH (mild or severe) and birthweight (under 1500 g or over 1500 g). Parents were informed of their infant's assignment after they gave approval to participate in the study.

The only person at the site who knew the actual order of eligibility and enrollment of subjects was the EIRI site coordinator. Additionally, the dates on which infants were identified as being eligible for this study were tracked to ensure that infants were assigned in the order in which they were identified.

Demographic characteristics. Demographic information was gathered by questionnaires regarding family composition, parent education and occupation, family income, ethnic background, and primary caretaking responsibilities of the participating families. At the time of the last testing reported herein, most of the families resided in the urban areas surrounding Salt Lake City and Ogden, Utah. Seventy-nine percent of the subjects lived in the Salt Lake City and Ogden area, while 10% lived in rural areas of Utah, Idaho, or Wyoming. Two subjects lived in California, three subjects lived in Ohio, Connecticut, and Washington, respectively.

The sample was composed of 90% Caucasian infants and 10% non-Caucasian infants from both urban and rural areas. One hundred percent of the participants lived in homes where English was the primary language, and most all (97%) lived in two-parent families. The educational level of the mothers ranged from 8th grade to college graduate, with a mean education level of 13.1 years. The fathers' education level ranged from 9th grade to Ph.D., with a mean of 13.8 years of education. Annual family incomes ranged from $2,500 per year to over $50,000 per year. Median yearly income for the families was $20,001.

Information concerning the mother's pregnancies was provided by the hospitals. About half of the mothers were rated as being in poor or fair health. For approximately 30% of the group, this was their first pregnancy, and another 33% had previous aborted pregnancies (spontaneous or induced). Most of the mothers were in their 20s, but 7 were 19 or under, and 15 were 30 or older.

The gestational age of the children ranged from 24 to 40 weeks, with only 4 infants reaching a gestationally appropriate age. The children ranged in birthweight from 530 g to 3636 g, with the median weight being 1225 g (i.e., a little under 3 pounds). About one-third of the children's IVH conditions were classified as more serious (grade III or IV). The days spent in the newborn intensive care unit ranged from 0 (for three of the children) to over 90 days (for another three children), with the median length of stay being 27 days. All but three of the children received at least one blood transfusion, and three received over 30 transfusions. The median number of transfusions was seven.

Analysis of pretest comparability of the groups on family demographic characteristics, mother pregnancy characteristics, and child medical characteristics, were performed for all subjects included in the study, those subjects posttested at 30 months CCA (Posttest #2), those subjects posttested at 42 months actual age (Posttest #3), and those subjects posttested at 54 months actual age (Posttest #4). These comparative analyses for all subjects initially assigned to groups and those tested at Posttest #4 are reported in Tables 5.1, 5.2, 5.3, and 5.4. The comparisons for those subjects tested at Posttests #2 and #3 were very similar to the comparisons of all subjects in the study; therefore, the results were not included in tabular form. Separate tables are included for Posttest #4 because fewer subjects have

Table 5.1

Comparability of Groups on Pretest Demographic Characteristics for Salt Lake City Medically Fragile Study (for Total Sample)

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Age of child in months at pretest	3.4	(.7)	28	3.3	(.5)	30	.46	-.14
• Age of mother in years	25.8	(4.4)	28	28.1	(5.6)	30	.10	.52
• Age of father in years	28.0	(5.1)	28	30.2	(5.8)	29	.13	.43
• Percent Male[*]	50.0		28	43.3		30	.62	-.12
• Years of education for mother[δ]	13.1	(2.3)	28	13.2	(2.0)	30	.87	.04
• Years of education for father[δ]	13.4	(2.3)	28	14.3	(2.1)	.09	.39	
• Percent w/both parents living[*+] at home	100		28	93.3		30	.17	-.24
• Percent of children who are[*] Caucasian	82.1		28	96.7		30	.07	.41
• Hours per week mother employed[δ]	9.6	(16.8)	28	10.2	(15.4)	30	.88	.04
• Hours per week father employed[δ]	42.3	(14.7)	25	41.9	(16.1)	26	.93	-.02
• Percent of mothers employed as[*] technical/managerial or above	25.0		28	10.0		30	.12	-.36
• Percent of fathers employed as[*] technical/managerial or above	21.4		28	44.8		29	.06	.46
• Total household income[♣]	$24,179	($17,760)	28	$29,650	($17,307)	30	.24	.31
• Percent receiving public assistance[δ*]	28.6		28	23.3		30	.66	-.11
• Percent of children in daycare[δ*] more than 5 hours per week	35.7		28	24.1		29	.35	-.31
• Number of siblings[δ]	1.2	(1.0)	28	1.5	(1.7)	30	.37	.31
• Percent with English as primary[*+] language	100		28	100		30	1.00	.00

[^] $$\text{ES} = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

[δ] Some posttest information was used to arrive at these figures.

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[♣] Income data were categorical and were converted by using the midpoint of each interval into continuous data.

[+] One of the groups has no variance.

Table 5.2

Comparability of Groups on Mother Pregnancy and Child Hospital Characteristics for Salt Lake City Medically Fragile Study (for Total Sample)

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• **Mother Pregnancy Characteristics**								
Maternal Health Rating♦	2.6	(.6)	25	2.1	(1.0)	28	.30	-.83
Diabetes %*	7.1		28	10.0		30	.70	.08
Bleeding at First Trimester %*	32.1		28	37.9		29	.65	.11
Placenta Privia %*	0		28	3.3		30		.13
No. of trimester(s) mother had prenatal care	4.8	(1.3)	28	4.4	(1.7)	30	.33	-.31
No. of pregnancies	2.5	(1.3)	28	3.2	(2.4)	30	.19	.54
No. of previous aborted pregnancies (spontaneous/induced)	.4	(.7)	28	.7	(1.3)	30	.34	.43
No. of pregnancies carried full-term	2.3	(1.1)	28	2.7	(1.7)	30	.29	.36
Mothers age at birth	25	(4.7)	28	26.4	(5.3)	30	.31	.30
Maternal Toxemia %*	0		28	0		30		-.01
• **Child Hospital Characteristics**								
Birthweight (grams)	1534	(681)	28	1302	(545)	30	.16	-.34
Grade of IVH* (% w/Grade III or IV)	39		28	30		30	.47	-.18
Gestational Age (weeks)	30.8	(3.5)	28	29.4	(2.7)	30	.10	-.40
1-Minute Apgar	4.0	(2.5)	28	3.7	(2.4)	29	.63	-.12
5-Minute Apgar	6.1	(2.0)	28	6.2	(1.5)	29	.89	.05
Apnea (%)*	57		28	67		30	.46	-.18
Seizures (%)*	11		28	13		30	.77	.06
Respiratory Distress Syndrome (%)*	7		28	13		30	.45	-.16
Bronchopulmonary Dysplasia (%)*	61		28	70		30	.47	-.18
Metabolic Acidosis (%)*	18		28	20		30	.84	-.04
Retinopathy of Prematurity*	25		28	33		30	.50	-.17
Hypertension (%)*	4		28	10		30	.34	-.18
No. of postnatal transfusions	8.2	(7.8)	28	10.6	(10.4)	30	.33	-.31
No. of days in NICU	26.1	(27.9)	28	35.5	(33.7)	29	.26	-.34

$$^\wedge\ \text{ES} = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

♦ Maternal health is rated poor, fair, good categories (1-3) with higher scores showing better health.

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

Table 5.3

Comparability of Groups on Pretest Demographic Characteristics for those Subjects Included in 54-Month Analysis for Salt Lake City Medically Fragile Study

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Age of child in months at pretest	3.3	(.6)	20	3.2	(.5)	19	.82	-.17
• Age of mother in years	25.9	(4.3)	20	29.0	(5.8)	19	.06	.72
• Age of father in years	27.4	(4.9)	20	31.3	(6.1)	19	.03	.80
• Percent Male[*]	40.0		20	42.1		19	.90	.04
• Years of education for mother[δ]	13.3	(2.3)	20	13.2	(2.2)	19	.84	-.04
• Years of education for father[δ]	13.6	(2.3)	20	14.3	(2.2)	19	.29	.30
• Percent w/both parents living[*] at home	100.0		20	100.0		19	1.00	.00
• Percent children who are Caucasian[*]	85.0		20	100		19	.08	.42
• Hours per week mother employed[δ]	13.0	(18.8)	20	10.7	(15.3)	19	.68	-.12
• Hours per week father employed[δ]	45.6	(13.2)	17	44.4	(16.1)	18	.82	-.09
• Percent of mothers employed as[*] technical/managerial or above	30.0		20	15.8		19	.30	-.29
• Percent of fathers employed as[*] technical/managerial or above	30.0		20	42.1		19	.44	.22
• Total household income[‡]	$28,375	($19,196)	20	$33,237	($18,351)	19	.42	.25
• Percent receiving public assistance[δ*]	30.0		20	21.1		19	.54	-.18
• Percent of children in daycare[δ*] more than 5 hours per week	40.0		20	33.3		18	.68	-.12
• Number of siblings[δ]	1.4	(1.0)	20	1.8	(1.9)	19	.37	.40
• Percent with English as[+*] as primary language	100		20	100		19	1.00	.00

[^] $$\text{ES} = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

[δ] Some posttest information was used to arrive at these figures.

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[‡] Income data were categorical and were converted by using the midpoint of each interval into continuous data.

[+] One of the groups has no variance.

Table 5.4

Comparability of Groups on Mother Pregnancy and Child Hospital Characteristics for those Subjects Included in 54-Month Analysis for Salt Lake City Medically Fragile Study

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• **Mother Pregnancy Characteristics**								
Maternal Health Rating♦	2.6	(.6)	18	2.2	(1.0)	18	.17	-.66
Diabetes %*	5.0		20	15.8		19	.28	.28
Bleeding at First Trimester %*	40.0		20	44.4		18	.79	.08
Placenta Privia %*	0		20	0		19		.01
Type of Delivery	2.3	(1.0)	20	1.8	(1.0)	19	.19	-.50
Drug Use	3.9	(2.2)	20	3.9	(2.1)	18	1.00	
No. of trimester(s) mother had prenatal care	5.1	(1.1)	20	4.6	(1.6)	19	.31	-.45
No. of pregnancies	2.6	(1.2)	20	3.6	(2.7)	19	.16	.83
No. of previous aborted pregnancies (spontaneous/induced)	.5	(.8)	20	.7	(1.5)	19	.55	.25
No. of pregnancies carried full-term	2.4	(1.1)	20	3.0	(1.9)	19	.21	.55
Mothers age at birth	24.9	(4.4)	20	26.9	(5.4)	19	.21	.45
Maternal Toxemia %*	0		20	0		19		.00
• **Child Hospital Characteristics**								
Birthweight (grams)	1534.0	(732.5)	20	1331.5	(572.3)	19	.32	-.28
Grade of IVH* (% w/Grade III or IV)	55		20	36.8		19	.27	-.33
Gestational Age (weeks)	30.9	(3.9)	20	29.6	(3.0)	19	.26	-.33
1-Minute Apgar	4.2	(2.5)	20	3.8	(2.6)	18	.65	-.16
5-Minute Apgar	5.9	(2.3)	20	5.9	(1.7)	18	.95	.00
Apnea (%)*	55		20	57.9		19	.86	.05
Seizures (%)*	15		20	21.1		19	.63	.14
Respiratory Distress Syndrome (%)*	5		20	15.8		19	.28	.28
Bronchopulmonary Dysplasia (%)*	60		20	68.4		19	.60	.15
Metabolic Acidosis (%)*	.0		20	10.5		19	.14	.33
Retinopathy of Prematurity*	.3	(.5)	20	.3	(.5)	19	.81	.00
Hypertension (%)*	5		20	5		19	.97	.01
No. of postnatal transfusions	9.6	(8.6)	20	11.9	(11.7)	19	.48	.27
No. of days in NICU	31.1	(30.8)	20	42.8	(33.9)	18	.27	.38

^ $ES = \dfrac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$

♦ Maternal health is rated poor, fair, good categories (1-3) with higher scores showing better health.

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

as yet, been tested. Some were not yet 54 months. Therefore, there is not as much attrition as it first appears. Analysis of family demographic characteristics (Table 5.1) indicated that of the 17 variables on which comparisons were made using a significance level of .10, there was a statistically significant difference between he groups for four variables, including mother's age, father's education level, percent of fathers employed as technical managerial or above, and percent of children who were Caucasian, with five children in the delayed group and one child in the early group being non-Caucasian. Given the many variables on which comparisons were made, it is not surprising that there was a statistically significant difference on several variables. When the data are considered in total, it appears that the groups were very comparable in terms of demographics. The slight advantage which may have existed was in favor of the group that received early intervention.

A comparison of the mothers' pregnancy characteristics, infants' medical characteristics (see Table 5.2) indicated that at pretest, the groups were similar on the pregnancy and medical characteristics. The only exception which is statistically significant ($p \leq .10$) is that children in the delayed intervention group had a higher gestational age (ES = -.40) than the children in the early intervention group. Several other variables, which were not statistically significant, indicate that the delayed intervention group had a slight advantage at pretest over the early intervention group. For example, children in the delayed intervention group were heavier (ES = -.34) and spent fewer days in the NICU (ES = -.34) and spent fewer days in the NICU (ES = -.34). Although not statistically significant, these differences were considered essentially important and were examined as use for potential covariates in the analysis reported later in this report.

The comparison of pretest demographic, mother pregnancy, and child characteristics for those tested at Posttest #4 (shown in Tables 5.3 and 5.4) demonstrated that these two limited groups were also very comparable. Approximately the same differences that exist with the total sample exist with this group of 39 families.

Subject attrition. To minimize attrition, the interveners and site coordinator in this project maintained updated telephone numbers and addresses for the participants. Data were collected in person or by mail approximately every 6 months for the child's first 18 months and monthly contacts were attempted after 18 months, so there was frequent contact with the families. A semiannual newsletter kept parents informed of the study. Arrangements were also made to provide intervention services and assessment for those participants who moved to another state. For example, children were assessed in the states of New Jersey, Georgia, Washington, Wyoming, Colorado, California, and Idaho. In each case, qualified examiners who were "blind" to the child's group membership and specific hypotheses of the study were located to administer follow-up assessments.

Despite the efforts to minimize attrition, a few children were lost to the study. At Posttest #1 (at adjusted age of 18 months), all 58 children participated in the testing; and at Posttest #2, all but one child participated. Testing is completed for these two posttests. At Posttest #3 (42 month), 52 children have been tested. Five children were, as yet, too young, and one child had died by this testing. Thirty-eight children have been tested for Posttest #4 (54 month). Fifteen were, as yet, too young and four did not participate. These non-participants included the one who had died. Two had moved and left no forwarding address (one of these was later found, but did not want to participate), and one who was not tested due to an earlier age adjustment error.

Intervention Programs

The intervention was conducted in two phases for this project. The first phase provided sensorimotor intervention to the early intervention (experimental) group beginning at 3 months corrected chronological age, while the delayed intervention (control) group received the current level of community service (referral to the NICU follow-up clinic). The second phase, delayed intervention, was received by all infants in both groups. Delayed intervention began when the infants reached 18 months corrected age and consisted of home--based intervention services based on the Curriculum and Monitoring System (CAMS), and sensory motor intervention provided at a physical therapy clinic, if needed.

Early intervention service. At three months corrected age, children in the early intervention group were referred to a licenced physical or occupational therapist for initial sensorimotor evaluation using the CAMS Motor Placement Test. At that time, scheduling and programming were discussed with the family. Frequency of intervention was determined by CAMS test scores, the type and quality of the infant's movement patterns, and the amount of interactive time the parents had available. Most infants were seen one or two times per month during the first few months when movement patterns were limited. The treatment schedule was flexible so that weekly visits were scheduled if abnormal patterns or tone were noted, or if significant delays persisted. However, if normal development with good quality of movement was occurring, intervention was limited to monthly or follow-up visits. Similar levels of early intervention program intensity for low birthweight infants have been described by Resnick et al. (1987; 1988), Raugh et al. (1988), Field et al. (1980), Nurcomb et al. (1984), and Piper et al. (1986).

Treatments consisted of individualized activities designed to encourage appropriate movement patterns in a normal developmental sequence. The activities were updated constantly to accommodate progress and were designed to be integrated into daily family routines. Parents were present during treatment sessions which lasted 45 minutes and included a review of progress on treatment goals, direct therapy, and an opportunity for the parent to work with the child. Parents were provided with written and illustrated home program activities. Parents were asked to work with the child at home at least 20 minutes per day, five days per week, on techniques they had learned in the intervention sessions.

Attendance and progress were monitored on an ongoing basis by the site coordinator by reviewing the therapist's progress notes. The CAMS placement test checklist was updated as goals were met. If a child required other equipment or services, or if the family needed financial assistance to buy rehabilitation equipment, the physical therapist referred the family to agencies in the Salt Lake City area or attempted to obtain equipment no longer being used by other children. The physical therapist also maintained a supply of equipment which she provided to subjects at no-cost. If a child moved out of state, intervention was arranged with local therapists if needed and was paid for by the research project. Progress was monitored by phone calls with family and/or reports from physical therapists.

As was explained earlier, the children in the delayed intervention group received no intervention through the project during this time period. Upon release from the hospital, they were referred to the Utah State Department of Health Neonatal Follow-up Clinic or follow-up from private physicians. They were free to access other services in the community if they desired.

Delayed intervention. At 18 months corrected age, the infants in the delayed intervention group also began to receive intervention services. The focus of intervention became home-based intervention for both the early intervention and delayed intervention children. Therefore, all children at 18 months corrected age were assessed using the CAMS, and goals were established for intervention.

The Curriculum and Monitoring Systems (CAMS) was designed to meet the educational needs of young children with disabilities served by the Multi-Agency Project for Preschoolers (MAPPS). The project collected data attesting to the efficacy of the program and was validated as an exemplary program for national dissemination by the Joint Dissemination Review Panel (JDRP) of the U. S. Department of Education. It was revalidated in 1985. MAPPS is one of only 21 early intervention projects validated by the JDRP. MAPPS is also a National Diffusion Network (NDN) program and has replication sites nationwide.

Each of the CAMS programs is printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. With training, CAMS can be used by parents, teachers, and paraprofessionals in the home or in an institutional/school setting. The five CAMS programs are: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development.

The ***Receptive Language Program*** teaches the student skills that do not require verbalization but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The ***Expressive Language Program*** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building and articulation.

The ***Motor Program*** is designed to teach gross and fine motor skills. The program stimulates normal motor development, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The ***Self-Help Program*** is designed to teach basic skills for self-care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The ***Social-Emotional Program*** is designed to teach basic social-emotional skills, including both child-adult and peer interactions.

The child development specialist met with the parent and child for one-hour once each month and provided intervention in the area(s) of need identified by the

CAMS placement test and by parent concerns. The parent was asked to spend 20 minutes each day 5 days each week providing similar intervention with their child at home. The child development specialist talked with the parent via telephone at least once between clinic appointments to check on progress and answer questions.

Typically, a monthly home visit by the child development specialist established goals for the child dependent upon the CAMS placement test. Some professionals will raise the question of whether the one-time-per-month service is of sufficient quantity. Although some home-based early intervention programs are more intensive than one-time-per-month, a survey of Roberts and Wasik (19xx) of 643 home-based early intervention programs (you will have to change and get the exact numbers) demonstrated that the one-time-per-month visit was the most typical service delivery option. Hence, this program is certainly consistent with typical practice. Furthermore, it should be remembered that the particular approach to early intervention used in this project was based on a nationally validated JDRP approved curriculum. Of course, the possibility remains that a more intensive program would have resulted in different findings, and that issue needs to be addressed with additional research. A typical intervention session was 45-60 minutes in duration. Each session began by asking how the child was doing and followed up on any problems (medical, family, etc.) discussed at the last visit. Then, using CAMS, the intervenor assessed the child's progress on the items suggested for home activities in the previous session. If the child passed these items, new activities were suggested and demonstrated. Following the assessment, the intervenor and child played with selected toys designed to teach age-appropriate skills (shape sorters, bead stringing, puzzles, etc.). Before the session ended, the intervenor wrote down the suggested activities, gave examples showing how to teach these activities, provided appropriate toys if necessary, and answered any questions the parent had.

For example, if the objective for a child was to point out facial features, the child development specialist taught the parent an exercise to teach the child facial features. When the next meeting occurred, the child development specialist asked the child to point out facial features. If the child showed competence in that area, a new objective was established. Some children had objectives in several domains, while others had only one. The child development specialist provided recommendations to parents regarding problems or concerns such as toileting or behavior.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, he/she also received motor intervention from the physical therapist following the CAMS program. Those children in the early intervention group who still required motor services continued meeting with the physical therapist. If a child who received motor services in the early intervention group no longer required those services, s/he terminated services with the physical therapist and received services from the child development specialist only. The physical therapist followed the same procedures outlined in the early intervention service section. Again, for those children living out of state, the site coordinator arranged for intervention with local agencies, and children were monitored through phone calls to parents.

Midway in the study, the focus of service provision changed slightly as appropriate community services became more available to young children with disabilities. In compliance with P.L. 99-457, the Utah Departments of Health and Education developed more early intervention and education programs to meet the special needs of these children. While children in the study continued to receive the interventions as previously described, parents were assisted in accessing community services when their children entered the delayed intervention phase. Children received both public and private preschool services, occupational, physical, and speech/language therapies, and services to the hearing and visually impaired.

In summary, all children had been involved in individualized intervention services at 18 months corrected age and thereafter. The frequency of the intervention varied. Some children also obtained other services in the community. The access of services by the family was monitored on a yearly basis when parents completed an "additional services form." The results of that assessment are discussed later.

With the ending of the funding for initial grant (September 1, 1990), the home visits made by the project staff ceased. Although the intervention portion of the project was finished, the site coordinator continued to attempt to find community programs for the families, when requested to do so by the family. With the intervention portion of the study being over but the research portion continuing, it seems appropriate to describe the sample at this time. As of September 1, 1991, the two groups were of similar age, with the children ranging in age from 2 to 6 years with a mean age of 4 years and 3 months. Some are starting to attend public schools, and few children in each group are receiving special education services and/or speech or physical therapy. At that time, 14 children from the sample were attending kindergarten; two of these were involved with special education programs. The one attending the Utah School for the Deaf was from the control group, and the other attending a program for children who had experienced IVH, was from the experimental group. Of the 16 children in preschool, one child from the control group, and two children from the experimental group were attending special education preschool programs. Time spent in these programs averaged 35 hours each week during the school year. One child (in the intervention group) attended a headstart program, which also ran for 35 hours each week during the school year. Weekly speech therapy sessions were received by six children from the control group (the average weekly time being one hour and 10 minutes) and two children from the experimental group (the average weekly time being three hours.) Physical therapy was received by three of the control subjects (averaging 1-1/2 hours each week), and seven of the experimental subjects (averaging two hours each week.)

Treatment Verification

In order to decide if an intervention is beneficial, it is extremely important to know whether the treatment had been implemented. Therefore, a number of procedures were implemented to verify that treatment was implemented as intended. Table 5.5 shows treatment verification data. Verification data included intervention provided by project and by additional services, that were arranged for by project or parents parent satisfaction ratings, and site visits.

Intervention sessions provided by project. Both home visits and clinic visits were recorded in the subject's file. These were summed together and appear on Table 5.5 under "number of intervention sessions provided by project." Only the early intervention group received these services during the 3- to 18-month age period, and services focused on sensory motor intervention. All children in the study received home-based services provided by the project after they reached 18 months of age; services included developmental intervention and motor intervention, if needed.

Regular phone contacts were also made with subjects (with only the early intervention group until 18 months of age), monitoring progress, making appointments, checking on services if they were living out of the area. Records of these phone contacts with parents were recorded in the interventionist's notes, but as yet, they have not been entered into the computer and analyzed.

The mean number of intervention sessions during the 3- to 18-month age period for the early intervention group was 17.0, with the number of sessions ranging from 1 to 36. Table 5.6 presents the frequency data for the intervention sessions

Table 5.5

Treatment Verification Data for the Salt Lake City Medically Fragile Study

	Delayed Intervention			Early Intervention			p Value	ES[^]
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
3-18 MONTH POSTTEST #1								
• No. of early intervention sessions[&,*] provided by project			28	17.0	(10.2)	30	---	---
• Additional Services[$]								
Hours of speech therapy	.4	(1.9)	28/3♦	1.0	(3.4)	30/6♦	.41	.30
Hours of physical therapy	20.1	(62.9)	28/9	14.1	(44.4)	30/9	.67	-.10
Daycare	86.1	(274.4)	28/4	158.5	(407.2)	30/9	.43	.26
Preschool	0	(0.0)	28/0	0	(0.0)	30/0	---	---
• Parent rating of satisfaction[#,*] with program	-----		28	3.9	(.3)	25	---	---
19-30 MONTH POSTTEST #2								
• No. of early intervention sessions[&] provided by project	4.5	(5.5)	28	10.1	(12.7)	30	.03	1.02
• Additional Services[$]								
Hours of speech therapy	1.2	(4.1)	26/3♦	.1	(.4)	29/1♦	.15	-.27
Hours of physical therapy	24.9	(81.0)	26/6	5.1	(12.7)	29/6	.20	-.24
Daycare	206.9	(424.0)	26/7	279.7	(523.3)	29/9	.58	.17
School	46.2	(117.4)	26/4	35.1	(148.7)	29/5	.76	-.09
• Parent rating of satisfaction[#,*] with program	3.7	(.5)	16	3.8	(.4)	14	.56	.20
31-42 MONTHS POSTTEST #3								
• No. of early intervention sessions[&] provided by project	3.8	(4.1)	26	6.9	(11.1)	26	.20	.76
• Additional Services[$]								
Hours of speech therapy	12.6	(50.2)	25/4♦	3.8	(16.2)	25/2♦	.41	-.18
Hours of physical therapy	17.9	(54.5)	25/6	1.6	(8.0)	25/1	.15	-.30
Daycare	263.8	(569.7)	25/7	326.4	(610.6)	25/7	.71	.11
School	107.7	(156.0)	25/12	90.2	(261.3)	25/6	.78	-.11
• Parent rating of satisfaction[#,*] with program	3.5	(.8)	18	3.7	(.5)	19	.26	.25

(continued)

[^] $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

[#] Parents involved in each alternative type of intervention rated their satisfaction with the program on a four-point scale (4 = excellent, 3 = good, 2 = fair, 1 = poor) in response to seven questions, the response to overall satisfaction is reported here.

[$] Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., daycare, preschool, physical therapy) was obtained via a parental questionnaire.

[*] Infants and families in the Delayed Intervention group received 0 early intervention services from the SLC/IVH project prior to 18 months of age; therefore, total intervention sessions received and parent rating of satisfaction are not reported.

[&] These services include sensory motor and developmental intervention, except that prior to 18 months of age (Posttest #1) only sensory motor intervention was provided.

[♦] Few families accessed additional services; hence, the number of families reporting a particular service is included along with the number who completed the survey (e.g., 28/3 indicates that 28 parents completed the form, but only 3 reported that particular service.

Table 5.5 (continued)

Treatment Verification Data for the Salt Lake City Medically Fragile Study

	All Subjects Included in Analyses							
	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
43-54 MONTH POSTTEST #1								
• No. of early intervention sessions[&*] provided by project	2.5	(2.6)	20	8.5	(20.3)	19	.20	2.31
• Additional Services[$]								
Hours of speech therapy	12.5	(37.0)	19/4♦	4.3	(18.6)	19/1♦	.39	-.22
Hours of physical therapy	20.5	(47.1)	19/5	19.5	(59.5)	19/3	.95	-.02
Daycare	138.1	(458.1)	19/5	379.8	(589.8)	19/7	.17	.53
School	341.8	(378.5)	19/15	478.8	(918.6)	19/10	.55	.36
• Parent rating of satisfaction[#*] with program	3.7	(.5)	11	3.5	(.5)	10	.31	-.40

[^] $ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$

[#] Parents involved in each alternative type of intervention rated their satisfaction with the program on a four-point scale (4 = excellent, 3 = good, 2 = fair, 1 = poor) in response to seven questions, the response to overall satisfaction is reported here.

[$] Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., daycare, preschool, physical therapy) was obtained via a parental questionnaire.

[*] Infants and families in the Delayed Intervention group received 0 early intervention services from the SLC/IVH project prior to 18 months of age; therefore, total intervention sessions received and parent rating of satisfaction are not reported.

[&] These services include sensory motor and developmental intervention, except that prior to 18 months of age (Posttest #1) only sensory motor intervention was provided.

[♦] Few families accessed additional services; hence, the number of families reporting a particular service is included along with the number who completed the survey.

Table 5.6

Frequency of Intervention Service Visits for the Early Intervention Groups Ages 3 to 18 Months for the Salt Lake City Medically Fragile Study

	Frequency	Percent	Cumulative %
Less than 5 visits	3	10.0	10.0
5 to 9 visits	6	20.0	30.0
10 to 14 visits	5	16.7	46.7
15 to 19 visits	4	13.3	60.0
20 to 24 visits	4	13.3	73.3
25 to 29 visits	4	13.3	86.7
30 and more visits	4	13.3	100.0
TOTAL	30	100.0	

attended for these children in the early intervention group. Three children received less than 5 visits, and an additional 9 received less than 15 visits, which would have been the number if each child had been visited monthly as planned. Forty percent of the children received 20 or more visits. The physical therapist's notes for the three children receiving less than 5 visits cite problems such as disconnected phone, frequent moves, no car, and missed appointments. Other files revealed child illness and hospitalization as reasons for cancelled appointments. Many of the children were developing normally, and only monthly or bimonthly visits were deemed necessary by the physical therapist. For the children who received 30 or more sessions with the project therapists, the therapist's notes portray children who had severe problems.

Additional services. Annually, parents completed a survey reporting additional services the child had received for the previous year. These additional services included speech therapy, physical and occupational therapy, daycare, and preschool. Across posttests, the majority of families did not access any type of additional services. As was stated earlier in the paper, the project director and/or home visitor sometimes helped families access other services as these services became available in the communities. These are recorded as additional services, along with those services the families accessed without any help. Less than 20% of the sample reported accessing speech therapy, physical therapy or school at any given posttest. For example, the number who did participate in the various categories are noted in Table 5.5. Under column "n," for example, 28/3 indicates that 3 of the 28 subjects accessed that particular service.

In addition to the average scores reported in Table 5.5, medians were computed for the speech therapy, physical therapy, and preschool at Posttest #1, #2, #3, and #4. All the medians were 0, again indicating that most of the children in the two groups did not receive additional services. Although the children in the delayed group did not receive intervention through the project, the parents were free to access services from the NICU follow-up service (only one family did), or other agencies. Knowing the amount of intervention services accessed by the delayed group is extremely important because if these parents independently accessed equal intervention, then there would be no treatment difference between the groups. Overall, during the 3- to 18-month period, few parents accessed additional services (see Table 5.5), and among the few who accessed any service, there was great variability in the amount of time spent. For example, for one child in the delayed intervention group, over 300 hours of additional services were reported at Posttest #1, while for another, 2 hours were reported for the same period of time. The services accessed by the one family reporting over 300 hours were rechecked with the mother and appear to be accurate. She had received speech therapy, physical therapy, social work visits, and services for the blind. Nevertheless, it appears that similar amounts of "additional" intervention were obtained by both groups. Consequently, treatment differences in sensory motor intervention existed between the early intervention and delayed intervention groups.

At Posttests #2, #3, and #4, the intervention received directly through the project, and additional intervention arranged by the project or parents are also reported on Table 5.5. The children in the early intervention group consistently received more intervention through the project than did the delayed intervention group, but the difference is statistically significant only at Posttest #2. On the other hand, the delayed group almost always received more speech and physical intervention and school through other services, but the differences did not reach the .10 level of statistical significance. Including intervention sessions provided by project and hours of speech and physical therapy and school, the two groups of children received approximately comparable intervention. Possibly, the liaisons formed with the project while the child was very young explains why there is a difference in where the children received the intervention.

Parent satisfaction with program. Another aspect of treatment verification is whether the parents are satisfied with the intervention services delivered by the program. Annually, parents were requested to complete a questionnaire regarding their satisfaction with the intervention services delivered by this program. The questionnaire consisted of seven program qualities that were rated on a scale of 1-4, with 4 being the most favorable rating. The final item requested rating of parent satisfaction with the program in general. At Posttest #1, the early intervention group's mean rating of satisfaction with the program was 3.9, indicating very favorable satisfaction (see Table 5.5). Also at the later posttests, parents in both the early and delayed intervention groups consistently rated the intervention favorably.

Site review. Formal site reviews were conducted during each year of the project. The last formal site review of the Salt Lake City IVH project was completed on August 17, 1990. Those participating in the site review included the site coordinator, the physical therapist, and two child development specialists. The purpose of the review was to collect information about the nature and quality of early intervention services that were delivered to verify that the research conducted by EIRI was implemented as intended, and to collect needs assessment data which would be useful to site administrators.

The site review was conducted as a part of the treatment verification process which is described in the Treatment Verification Handbook for Research Sites (Frede, 1988), and was implemented according to the general procedures described in the Guide for Site Reviews of EIRI Research Sites, which is found in Part II of the handbook. The site review took place at K2D2, the facility where most sensorimotor and CAMS interventions were delivered and included a review of eight randomly-selected subject records, observations of one sensorimotor and one CAMS intervention session, interviews with intervenors, and inspection of the facility.

The review team found that there were substantial differences in the services provided to the two groups prior to 18 months. Intervention services judged to be of high-quality were provided to the early intervention group prior to 18 months CCA and to both groups after 18 months CCA. Assessment procedures were carried out regularly, appropriate plans and records documenting interventions and child progress were in place. It was found that several of the older subjects in the study were working on the final objectives in the CAMS curriculum.

Contextual Variables

Other events transpired in the families' lives during the intervention that might affect child development or family functioning. It is important to know if these other contextual factors differed for the two groups because these factors might have influenced the child and family outcome measures.

Family demographic variables, reports of family resources and other family stresses, the child's health, and the intervenor's rating of the parent's participation in the intervention, were the contextual factors analyzed. Consequently, demographic data that were subject to change, including family composition, hours mother works, total income, and percent receiving public assistance were collected at each posttest. As can be seen in Table 5.7, the groups appear very comparable on the demographic factors and the reports of other family stresses and resources across posttests.

Parents also completed a Child Health Survey at each posttest. The item rating the child's general health (reported in Table 5.7) is rated from 1 (health condition worse than other children) to 3 (health condition better than other children). The children's health across posttests appears to be very similar between the groups, with group means ranging from 1.7 to 2.2, indicating average health.

Table 5.7

Comparability of Contextual Factors for the Delayed and Early Intervention Groups for the Salt Lake City Medically Fragile Study

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
3-18 MONTH: POSTTEST #1								
• Key Family Demographics								
Child living with both parents (%)	85.7		28	93.3		30	.35	.22
Mother's hrs. of work per week	11.8	(17.0)	27	13.9	(16.9)	29	.65	.12
Total income	$27,827	(20,629)	26	$33,111	($21,011)	27	.36	.26
% receiving public assistance	29.6		27	30.0		30	.98	.01
• Family Functioning								
Family Stress (FILE)♦	12.0	(6.3)	28	10.8	(6.8)	28	.48	.19
Family Resources (FRS)&	121.9	(18.2)	28	130.1	(21.1)	29	.12	.45
• Child Health@	1.7	(.5)	18	2.0	(.6)	22	.17	.65
• Intervenor Rating of Parents *								
Attendance				2.6	(.6)	25		
Support				2.3	(.6)	25		
Knowledge				2.2	(.7)	25		
19-30 MONTH: POSTTEST #2								
• Key Family Demographics								
Child living with both parents (%)	88.9		27	89.7		29	.93	.03
Mother's hrs. of work per week	12.2	(15.6)	26	13.7	(17.4)	24	.75	.10
Total income	$29,630	($20,157)	27	$30,982	($23,349)	28	.82	.07
% receiving public assistance	26.9		26	34.6		26	.56	.15
• Family Functioning								
Family Stress (FILE)♦	11.1	(7.9)	27	9.7	(6.3)	29	.46	.18
Family Resources (FRS)&	120.3	(20.8)	27	125.9	(18.7)	29	.29	.27
• Child Health@	1.8	(.6)	25	2.1	(.6)	26	.09	.52
• Intervenor Rating of Parents *								
Attendance	2.7	(.6)	24	2.4	(.8)	26	.14	-.55
Support	2.6	(.7)	22	2.3	(.7)	26	.06	-.45
Knowledge	2.7	(.5)	24	2.2	(.8)	26	.02	-1.04

(continued)

^ $ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$

[*] Scores based on a three-point rating (1 = low, 2 = average, 3 = high) completed by the intervenor most involved with the family. Infants and families in the Delayed Intervention group received no early intervention services from the SLC/IVH project prior to 18 months of age and therefore, Intervenor Ratings of Parents are not reported.

[$] Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., home nursing, physical therapy, tutoring) was obtained via a parental questionnaire.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[♦] Analyses for the FILE are based on raw scores. Lower scores are considered better.

[&] Analyses for the FRS are based on raw scores indicating number of resources indicated by the family as being available. Higher scores and positive ESs are considered better.

Table 5.7 (continued)

Comparability of Contextual Factors for the Delayed and Early Intervention Groups for the Salt Lake City Medically Fragile Study

	Delayed Intervention			Early Intervention				
	x̄	(SD)	n	x̄	(SD)	n	p Value	ES^
31-42 MONTH: POSTTEST #3								
• Key Family Demographics								
Child living with both parents (%)	80.0		25	87.5		24	.49	.17
Mother's hrs. of work per week	12.0	(18.9)	23	13.8	(17.4)	24	.75	.10
Total income	$34,020	($24,771)	25	$35,500	($26,976)	24	.84	.06
% receiving public assistance	40.0		25	36.0		25	.78	-.07
• Family Functioning								
Family Stress (FILE)♦	9.7	(5.3)	25	9.4	(6.4)	25	.87	.06
Family Resources (FRS)&	124.4	(18.2)	25	123.6	(20.0)	25	.88	-.04
• Child Health@	1.9	(.4)	24	2.0	(.5)	24	.33	.24
• Intervenor Rating of Parents *								
Attendance	2.9	(.3)	20	2.5	(.7)	24	.02	-1.29
Support	2.7	(.6)	20	2.7	(.6)	24	.93	.00
Knowledge	3.0	(.2)	20	2.7	(.5)	24	.02	-1.36
43-54 MONTH: POSTTEST #4								
• Key Family Demographics								
Child living with both parents (%)	85.0		20	88.2		17	.78	.06
Mother's hrs. of work per week	19.9	(19.1)	18	18.9	(18.0)	17	.88	-.05
Total income	$37,333	($24,076)	18	$38,882	($24,586)	17	.85	.06
% receiving public assistance	20.0		20	18.8		16	.93	-.01
• Family Functioning								
Family Stress (FILE)♦	9.3	(5.0)	19	9.0	(6.9)	19	.89	.06
Family Resources (FRS)&	124.5	(22.1)	19	127.3	(17.6)	18	.67	.13
• Child Health@	2.0	(.6)	18	2.2	(.6)	18	.25	.34
• Intervenor Rating of Parents *								
Attendance	2.6	(.5)	10	2.4	(.6)	5	.50	-.38
Support	2.7	(.5)	10	2.2	(.8)	5	.16	-1.04
Knowledge	2.5	(.5)	10	2.2	(.8)	5	.41	-.57

$$^\wedge\ \text{ES} = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

[*] Scores based on a three-point rating (1 = low, 2 = average, 3 = high) completed by the intervenor most involved with the family. Infants and families in the Delayed Intervention group received no early intervention services from the SLC/IVH project prior to 18 months of age and therefore, Intervenor Ratings of Parents are not reported.

[$] Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., home nursing, physical therapy, tutoring) was obtained via a parental questionnaire.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[♦] Analyses for the FILE are based on raw scores. Lower scores are considered better.

[&] Analyses for the FRS are based on raw scores indicating number of resources indicated by the family as being available. Higher scores and positive ESs are considered better.

Intervenors rated the parents annually on their support of, and involvement with, their child's program, and on their knowledge of their child's condition and program. The parent qualities were rated on a scale of 1-3, where 3 represented the most favorable rating. Mean scores ranged from 2.20 to 3.0, indicating that intervenors rated parents as having above average parent involvement qualities.

At Posttest #1, only the parents in the early intervention group were rated by the intervenor. The mean scores of 2.2 and above indicate favorable ratings. At Posttest #2 and #3, parents of children in the delayed intervention group were consistently rated more favorably by the intervenor than were the early intervention group with four of the six comparisons being statistically significant. These findings are puzzling. Possibly the parents in the delayed group were more involved in the intervention because they had "missed" the earlier opportunity. However, with the delayed intervention group reporting less intervention sessions with the project intervener at each posttest (refer back to Table 5.5), this explanation seems doubtful. Another explanation might be that the interveners rated the parents they knew better more realistically than they did the parents they had less contact with. Next year, a Posttest #4 comparison with a more complete cohort might help to interpret these findings.

Although the parents appear to differ some on their support of their child, attendance at meetings with the project intervenors and knowledge, over all the other contextual variables (including demographic variables, family functioning scores, and child health), the two groups appear to be fairly similar. Thus, the influence of these contextual variables on the outcome measures of child development and family functioning would appear to be comparable for both the early and the delayed intervention groups.

Cost of Alternative Interventions

The cost per child for the early intervention group (23 children) represents an accumulated cost of intervention from July 1986 to July 1988, the total program cost for two years and two phases of intervention as outlined under the intervention program description. The cost for services was from the date these 29 children turned 18 months of age and services began until 1988, the end of FY 1987-88. In Table 5.8, all cost estimates were adjusted for inflation to 1990 dollars. In addition, at the bottom of the table, the figures were discounted at 3% and 5%.

To arrive at the cost per child, total program costs were determined for each group and divided by the number of children in the group. As illustrated in Table 5.8, program costs included direct service and program and university administration, occupancy, equipment, transportation, and materials and supplies used for the respective groups.

Personnel costs included wages and benefits for the physical therapist, the developmental specialist, diagnosticians, a graduate assistant, and a secretary. Each of these were pro-rated according to actual time spent on intervention-related activities. Research costs in this, and all other resource categories, naturally, were excluded. Program administration included salaries and benefits for the percentage of FTE administrative personnel worked on the project. The university administrative cost applied to the small portion of the project that was operated out of Utah State University. For this, the university indirect rate for general, departmental, and sponsored projects administration was used (31.78%). Occupancy charges included rent paid for office space, utilities, maintenance, and insurance. Equipment costs included the cost of office furniture, computers, intervention toys and treatment equipment, and a supply of equipment available for loans to parents (seating devices, walkers, etc.). These costs were based on market replacement values for each item and annualized at a rate which accounted for interest and

Table 5.8

Cost Per Child for Two Years of Intervention (1986 - 1988) for the Salt Lake City Medically Fragile Study (1990 dollars)

Resources	Early Intervention (n = 23)	Delayed Intervention (n = 29)
1. **UNDISCOUNTED:**		
Agency Resources		
Direct service personnel	$ 2,101	$ 693
Administration		
program	395	127
university	126	40
Occupancy	250	78
Equipment	149	45
Transportation	49	19
Materials/supplies	60	30
SUBTOTAL	**$ 3,130**	**$1,032**
Contributed Resources		
Parent Time	2147	716
Parent Transportation	157	97
SUBTOTAL	**$ 2,304**	**$ 813**
Total	**$ 5,434**	**$1,845**
2. **DISCOUNTED AT 3%:**		
Total Agency Resources	$ 3,491	$1,127
Total Resources	6,058	2,015
3. **DISCOUNTED 5%:**		
Total Agency Resources	$ 3,747	$1,194
Total Resources	6,501	2,135

**Totals may not add up due to rounding errors.*

depreciation to determine the annual equipment cost. Agency transportation costs for home visits were calculated at $.21 per mile based on actual mileage.

Because the program relied heavily on parent participation for both intervention and, as the child got older, for transportation to the center, the opportunity cost of parent time was also determined. These costs were presented as "contributed resources" on Table 5.8. Parent time included time spent in (1) center and home visit sessions with either the physical therapist or the developmental specialist at one hour each; (2) intervention activities recommended by the program (20 minutes daily) for each parent and child at home; and (3) transportation time and expenses. Parents spent an average of 142 hours in Year One and 71 hours in Year Two in session with professionals and conducting intervention activities at home. Parent transportation costs in Year Two were gathered via telephone interview during which parents reported the number of trips taken to the center, the round-trip distance, and travel time. As reported in the economic section of the report, parent time was assigned the value of $9 per hour based on the average hourly earnings plus benefits for all working women in the U.S.

For children entering the program at 3 months adjusted age and receiving two years of individualized intervention from both professionals and their professionally trained parents the undiscounted cost of the program was $5,434 per child; for children entering the program later at 18 months, the cost was $1,845, including the value of parent time. The cost per child for two years of intervention is more than twice the cost for one year. This can be attributed to the emphasis on physical therapy in Year 1, which cost more than services from the developmental specialist. At 18 months, the program switched its emphasis for all children in the program from physical therapy to speech, self-help, social, and other age-appropriate skills.

Data Collection

Data were collected to determine the effects of intervention upon the child and the family. The assessment instruments were chosen to provide some consistency of data collection across sites, but also to provide information about children with intraventricular hemorrhage at birth and the unique experiences of their families. Additional assessments described in this section were administered as the subjects developed additional skills not present in younger children. Table 5.9 presents a schedule of pre- and posttest measures and the ages at which they are administered, and Table 5.10 provides a description of the measures.

Table 5.9

Schedule of Administration of Measures for Salt Lake City Medically Fragile Study

	Pretest 3 month	6 month	12 month	Posttest #1 18 month	Posttest #2 30 month	Posttest #3 42 month	Posttest #4 54 month	Posttest #5 66 month
CHILD MEASURES								
Battelle Developmental Inventory	X			X	X	X	X	X
Child Health				X	X	X	X	X
Binet Screening Test					X	X	X	X
Preschool Language Scale						X	X	
Draw-A-Person							X	X
Visual Motor Integration							X	X
Infant Temperament Questionnaire		X						
Toddler Temperament Questionnaire					X			
Carey Behavioral Style Checklist							X	
Child Behavior Checklist							X	X
Parent-Child Interaction Video			X		X	X	X	X
Motor Video			X					
Bruininks-Oseretsky								X
FAMILY MEASURES								
FSS	X			X	X	X	X	X
FRS	X			X	X	X	X	X
FACES	X			X	X	X	X	X
Demographics	X			X	X	X	X	X
FILE	X			X	X	X	X	X
PSI	X			X	X	X	X	X
Additional Services				X	X	X	X	X

Recruitment, training, and monitoring of diagnosticians. Rigorous certification procedures and requirements were implemented to ensure the qualifications and reliability of the diagnosticians administering assessments for the SLC/IVH study. Diagnosticians were required to independently become familiar with the BDI through study of the test manuals and viewing of a videotaped test administration. The diagnosticians then completed a 1½ day BDI administration training session conducted by a certified assessment trainer. During the training session, BDI testing procedures were explained, demonstrated, and practiced. Following the training session, diagnosticians completed three practice BDI administrations. The final practice administration was videotaped and then reviewed by the assessment coordinator. After the assessment coordinator verified that the diagnostician had correctly administered the test, the diagnostician began testing children for the study. Three diagnosticians completed the requirements to administer the pretest and posttest measures. One diagnostician had a Ph.D. in psychology, and two were Ph.D. candidates in psychology. The Ph.D. candidates were recruited from Utah State

Table 5.10

Description of Tests Administered for Salt Lake City Medically Fragile Study

MEASURES	DESCRIPTION
CHILD MEASURES	
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Child Health (E.I.R.I.)	Assesses the parents' evaluation of the child's health during the past year, including general health, illnesses, hospitalization, etc.
Stanford-Binet Screening Test (Thorndike, Hagon, & Sattler, 1986)	Measures general intellectual ability for individuals from ages 2 to 18. One subtest is used from each of the following subtests: vocabulary, pattern analysis, quantitative, and bead memory.
Preschool Language Scale (PLS) (Zimmerman, Steiner, & Evatt, 1969)	Evaluates language strengths and deficits in the areas of auditory comprehension and verbal ability. It also assesses articulation and is designed for children ages 18-months to 7 years.
Draw A Person (D.A.P.)	The child is given a blank piece of 8" x 11" paper and asked to draw him (her) self. A raw score and age equivalent rating is determined by the number of body parts that are drawn and the proportion and detail of those parts.
Developmental Test of Visual-Motor Integration (V.M.I.) (Beery, 1989)	This measure includes a 24-item developmental sequence of geometric forms that is intended to identify early learning and behavioral problems. It is a paper and pencil test that can be administered individually or in groups.
Infant Temperament Scale (I.T.S.) (Carey, McDevitt, Revised 1977)	This scale is a 95-item questionnaire that assesses the primary caregivers' estimate of the 4- to 8-month infant's temperament. Six aspects of temperament are each rated on a scale of 1 to 6, with high scores representing behavior more difficult to handle. Scoring categorizes the infant into easy, intermediate, slow-to-warm and difficult clusters.
Toddler Temperament Scale (TTS) (Fullaro, McDevitt, & Carey, Revised 1982)	This scale is a 99-item questionnaire completed by the primary caregiver. It is designed to assess the temperament or behavioral style in 1- to 3-year-old children. Scoring categorizes the toddler into easy, intermediate, slow-to-warm, and difficult clusters.
Behavioral Style Questionnaire (BSQ) (McDevitt & Carey, 1975)	This scale is a 100-item questionnaire completed by the primary caregiver. It assesses the temperament or behavioral style in 3- to 7-year-old children. Scoring categorizes the child into easy, intermediate, slow-to-warm, and difficult clusters.
The Child Behavior Checklist for Ages 4 to 5 (CBCL) (Achenback, 1986)	This test is designed to obtain standardized data on children's social competencies and internalizing and externalizing behavioral problems as reported by their parents.
Parent/Child Interaction (E.I.R.I.)	A 15- to 20-minute videotape of parent-child interaction following a set protocol devised by EIRI.
Videotaped Assessment of Motor Functioning (Peterson & Miller, 1985)	A videotaped procedure assessing quality of spontaneous motor development in 12-month-old infants.

(continued)

Table 5.10 (continued)

MEASURES	DESCRIPTION
The Bruininks-Oseretsky Test of Motor Proficiency (Bruininks, 1978)	This is an individually administered test of gross and fine motor functioning of children from 4-1/2 to 14-1/2 years of age. The test contains 46 items divided among eight subtests. Scores are obtained for an overall composite, gross motor and fine motor domains, and for each subtest.
FAMILY MEASURES	
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: Intra-Family, Marital, Pregnancy and Childbearing, Finance and Business, Work-Family Transitions, Illness and Family "Care", Losses, Transitions "In and Out", and Legal.
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors.
Additional Services (E.I.R.I.)	Provides data on services the child and family have received during the past year outside the study (e.g., schooling, early intervention, speech therapy, physical and occupational therapy, and tutoring).

University and the University of Utah Graduate Schools. Testing for later posttests were done by a diagnostician with a Ph.D. in psychology and Ph.D. candidates in psychology and child development.

Infants were pretested by a child development specialist, who did not know the group assignment of the child. Different diagnosticians who had no involvement with the project or the interveners were chosen and trained to do the posttest assessments. In this way, it was ensured that diagnosticians were "blind" to the child's group assignment in the study.

To maintain records on the continued quality of the test results, shadow scoring of 10% of test administrations for each diagnostician was conducted by another trained diagnostician who had three years of experience in administering the BDI. Interrater reliability indicates that the diagnosticians are administering the tests with a reliability level above .90. Testing was scheduled directly with the diagnosticians by the site coordinator.

Pretesting. The pretesting was completed when the infants were at 3 months corrected age (prematurity corrected to 40 weeks plus 3 months). The measures used are listed in Table 5.9. Parent measures indicated as being given at Posttest #1 were not completed by all parents; some of these measures were introduced after the first parents had entered the study. All test and questionnaire protocols were sent to the EIRI site coordinator for scoring and placement in the EIRI file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the new-born.

Interim testing. When infants were 6 months corrected age, their parents were mailed the Carey Infant Temperament Scale to complete. This questionnaire was returned directly to the site coordinator via postpaid mail. Parents were paid $10 for completing the questionnaire.

Videotapes of parent-infant interaction and motor development were completed by a trained child development specialist or a licensed physical therapist when the infants were 12 months corrected age. These videotaped sequences were rated by trained individuals who were "blind" to the study design and subject assignment to experimental conditions. Parents were paid a $10 incentive for videotaping. The parent-child interaction videotape involved the parent and child in play activities. In the first section, the mother and child played together for 15 minutes "as they would at home." Then for one minute the parent encouraged the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent left the room for 45 seconds. Taping continued for two minutes after the parent returned to the room.

The videotape of motor functioning followed a specific script. The motor script encouraged the child to perform the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

Posttesting. Infants were posttested at 18 months corrected age and annually thereafter according to the schedule in Table 5.9. The measures are explained in Table 9.10. Appointments were made with the parents for the annual testing. Most of the testing was done in the children's homes, but some was done at mutually convenient places. In addition to the diagnostician who performed the child development assessments, at Posttest #6, an occupational therapist performed the Bruininks-Oseretsky Test of Motor Proficiency. Parents were paid for each testing (Posttest #1, $20; Posttest #2, $25; Posttests #3 and #4, $35; and Posttest #5, $40.)

On July 1, 1991, the 18- and 30-month posttests were completed; the 42, 54, and 66 month posttests were partially complete; the 78-month posttest battery was being chosen. Table 5.11 reports the assessment to date.

Table 5.11

Testing Schedule for Salt Lake City Medically Fragile Study

Time of Assessment	Number Assessed to Date
3 Months	58
18 Months	58
30 Months	57
42 Months	52
54 Months	39
66 Months	18

Results and Discussion

The purpose of the Salt Lake City IVH study was to compare the effectiveness of intervention begun early (at 3 months adjusted age) to intervention begun later (at 18 months adjusted age) for children with a history of perinatal intraventricular hemorrhage. The children were pretested when they were 3 months corrected age, and posttested at 18 months corrected age and yearly thereafter. The posttest analyses reported here included all children who participated in the 18-, 30-, 42-, and 54-month posttest.

Comparability of Groups on Pretest Measures

As was noted in the section on pretest demographic comparisons, the families in the delayed and early intervention groups were very comparable (see Table 5.1). Few statistically significant differences were found between the groups. The differences included mother's age, father's education level, percent of fathers employed as technical/managerial or above, and percent of children who were Caucasian. These differences indicate a slight advantage in favor of the early intervention group.

The maternal pregnancy characteristics were found to be very similar for the two groups (see Table 5.2). The child hospital characteristics were also comparable, with the advantage being in favor of the delayed intervention group.

At the adjusted age of 3 months, child functioning was measured with the Battelle Developmental Inventory (BDI). The BDI is a norm-referenced, standardized assessment of development in children from birth to 8 years of age and assesses five developmental domains: personal social, adaptive, motor (gross and fine), communication (receptive and expressive), and cognitive. When their scores were compared, the groups were found to be similar in the personal/social, adaptive, and cognitive domains. However, statistically significant differences were found on the motor and communication domains (motor p = .01, ES = .61, communication p = .01, ES = .64) with the children in the early intervention scoring higher than the children in the delayed intervention group (see Table 5.12). Similar differences were found in the pretest BDI scores for those included in the 54-month testing (see Table 5.13).

Two issues from these findings are relevant to interpreting the outcome data. First, does the statistically significant differences reflect real functional differences? In administering the Battelle to 3-month-old infants, 6 or less items are used for each domain. Therefore, the difference in mean scores probably reflects the difference in completing one item.

Table 5.12

Comparability of Pretest Child and Family Measures for Salt Lake City Medically Fragile Study

	Delayed Intervention				Early Intervention					
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES[^]
• Age in months at pretest	3.4	(.7)		28	3.3	(.5)		30	.46	-.14
• **Battelle Developmental[*] Inventory (BDI)**										
Personal/Social	17.9	(4.8)		28	19.1	(5.0)		30	.35	.25
Adaptive Behavior	13.1	(3.5)		28	14.1	(2.9)		30	.25	.29
Motor	12.3	(3.3)		28	14.3	(2.2)		30	.01	.61
Communication	9.3	(2.2)		28	10.7	(1.7)		30	.01	.64
Cognitive	6.5	(2.8)		28	7.3	(2.4)		30	.21	.29
TOTAL	59.0	(14.4)		28	65.6	(9.9)		30	.05	.46
• **Parenting Stress[+] Index (PSI)**										
Child Related (range 47 to 235)	106.3	(21.4)	67	22	100.7	(19.7)	57	24	.36	.26
Other Related (range 54 to 270)	132.7	(29.8)	71	22	124.5	(19.2)	58	24	.27	.28
TOTAL (range 101 to 505)	239.0	(40.8)	70	22	225.0	(34.9)	56	24	.22	.34

[^] $$\text{ES} = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the age equivalent (AGE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[+] Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores and positive ESs are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals. A low percentile score indicates low stress.

Table 5.13

Comparability of Pretest Child and Family Measures for Subjects included in 54-Month (Posttest #4) Testing for Salt Lake City Medically Fragile Study

	Delayed Intervention				Early Intervention					
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES^
• Battelle Developmental[*] Inventory (BDI)										
Personal/Social	16.8	(5.0)		20	18.9	(4.0)		19	.16	.42
Adaptive Behavior	12.3	(3.7)		20	13.5	(3.0)		19	.27	.32
Motor	11.7	(3.4)		20	14.1	(2.4)		19	.01	.71
Communication	9.1	(2.5)		20	11.0	(1.3)		19	.01	.76
Cognitive	6.6	(3.1)		20	7.8	(2.3)		19	.15	.39
TOTAL	56.4	(15.6)		20	65.4	(8.8)		19	.03	.58
• Parenting Stress[+] Index										
Child Related (range 47 to 235)	116.2	(23.2)	85	19	101.0	(20.0)	57	18	.40	-.66
Other Related (range 54 to 270)	129.2	(20.9)	65	19	123.6	(28.5)	56	18	.50	-.27
TOTAL	245.4	(40.9)	76	19	224.6	(43.3)	56	18	.14	-.51

^ $ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the age equivalent (AGE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[+] Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores and positive ESs are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

Second, how well do BDI developmental scores at 3 months of age predict later development? With a sample of 30 infants ranging in age of 5 months to 30 months, the correlations of the BDI with the Bayley Scales of Infant Development (Bayley, 1969) ranged from .27 to .95 (Boyd, Welge, Sexton, & Miller, 1989) indicating concurrent validity for the BDI scales. However, as Bayley (1970) herself states, there is often no correlation between the IQ scores measuring sensorimotor abilities attained by normal babies and their subsequent IQ scores. The same statement is probably true for infants born with physical disabilities or at risk for such disabilities. In comparing correlations of pre- and posttest BDI scores in the present EIRI studies, much higher correlations between pre- and posttest #1 were found for those who were preschoolers at pretest (correlations ranging from .32 to

.91) than for those in this study who were 3 months adjusted age at pretest. These correlations ranged from .04 to .49. Although the differences in mean pretest scores should be noted (the total BDI raw score was used as a covariate for the analyses of all subsequent posttest developmental measures), the pretest BDI difference between groups may not be as important as might initially be thought.

The Parenting Stress Index (Abidin, 1983) was completed by a parent in 46 of the families. The Parenting Stress Index provides two subscores, child-related stress and other related stress, and a total parenting stress score. With this reduced sample, significant differences were not found between the scores on parenting stress, but the percentiles and the effect sizes indicate that the parents in the early intervention group reported slightly less stress than did the parents in the delayed intervention group.

In summary, there are slight advantages in favor of the delayed intervention group on both medical characteristics and demographic variables, and slight advantages for the early intervention group on pretest measures on the BDI and measures of parenting stress. When these differences are considered together, particularly in light of the number of tests of statistical significance that were done, it appears that the groups were very comparable at pretest and that the random assignment worked as expected.

Effects of Early Versus Delayed Intervention on Measures of Child Functioning

Selection of covariates. Analysis of covariance procedures were used to measure differences between groups on measures of child and family functioning following early intervention services to one group of infants and delayed intervention to the other group. Treatment group served as the independent variable and the dependent variables were scores obtained from the assessment instruments described earlier. Analyses other than analyses of covariance are described as such in the text and/or the table. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. For example, number of days in NICU and pretest BDI Total raw score were used as covariates for 18-month personal/social raw scores. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $p \leq .10$ and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977) in those cases where a covariate or set of covariates could be found which correlated with the dependent variable in question (which was almost the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 81% for finding moderate-sized differences (defined by Cohen as differences of a half-a-standard deviation.)

Table 5.14 reports the results of the ANCOVA comparisons for the child outcome measures of development, IQ, temperament, and language at 18, 30, 42, and 54 months

Table 5.14

Comparison of Posttest Measures on Child Functioning for Children in Delayed and Early Groups in the Salt Lake Medically Fragile Study

		Delayed Intervention				Early Intervention						
	Covariates$ In Order	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	P Value	ES^
18-MONTH TESTING (POSTTEST #1)												
Age in Months at Posttest #1♣		21.1	(1.3)		28	21.3	(.8)		28	.36	.55	.15
Battelle Developmental Inventory (BDI)												
Raw scores for:												
Personal/Social	1,2	55.5	(12.2)	55.4	28	55.6	(15.2)	55.7	30	.01	.93	.02
Adaptive Behavior	1,2	40.6	(9.0)	40.9	28	41.1	(9.1)	40.9	30	.00	1.00	.00
Motor	1,2	59.8	(16.7)	60.7	28	61.4	(15.4)	60.4	30	.01	.94	-.02
Communication	1,2	28.7	(6.2)	29.2	28	29.1	(6.4)	28.6	30	.13	.72	-.10
Cognitive	1,2	22.1	(4.1)	22.4	28	21.9	(4.3)	21.6	30	.47	.49	-.20
TOTAL	1,2	206.7	(40.6)	208.6	28	209.1	(44.5)	207.3	30	.02	.90	-.03
Infant Temperament Questionnaire♦												
Activity		423.0	(68.6)		21	433.5	(55.0)		20	.29	.59	-.15
Rhythmicity		285.8	(58.4)		21	268.9	(66.2)		20	.75	.39	.29
Approach		259.3	(50.5)		21	243.8	(62.8)		20	.77	.39	.31
Adaptability		242.9	(57.6)		21	234.5	(57.5)		20	.22	.65	.15
Intensity		350.6	(87.1)		21	339.0	(64.3)		20	.23	.63	.13
Mood		304.9	(58.1)		21	280.6	(63.3)		20	1.65	.21	.42
30-MONTH TESTING (POSTTEST #2)												
Age in months at Posttest #2♣		32.9	(1.5)		28	33.0	(.9)		29	.15	.70	.07
Battelle Developmental Inventory (BDI)												
Raw Scores for:												
Personal/Social	1,2,3	83.9	(20.5)	84.6	28	85.2	(23.5)	84.5	29	.00	.98	-.01
Adaptive Behavior	1,2,3	54.5	(12.4)	55.3	28	56.5	(15.5)	55.7	29	.01	.93	.03
Motor	1,2,3	78.5	(18.0)	80.7	28	80.1	(19.2)	77.9	29	.36	.55	-.16
Communication	1,2,3	40.4	(9.1)	41.3	28	41.3	(10.2)	40.5	29	.08	.78	-.09
Cognitive	1,2,3	29.4	(7.4)	30.3	28	29.8	(7.5)	28.9	29	.60	.44	-.19
TOTAL	1,2,3	286.6	(58.9)	292.3	28	293.0	(68.3)	287.3	29	.09	.76	-.08
Stanford Binet IQ♠	1,2,3,4	99.5	(9.7)	98.8	26	99.2	(10.5)	99.9	26	.11	.74	.11
Toddler Temperament Scale♦												
Activity		375.3	(79.5)		25	385.5	(71.7)		27	.24	.63	-.13
Rhythmicity		286.4	(87.6)		25	267.6	(59.5)		27	.82	.37	.21
Approach		317.5	(106.1)		25	309.3	(106.2)		27	.08	.78	.08
Adaptability		293.3	(87.6)		25	287.2	(80.7)		27	.07	.80	.07
Intensity		387.2	(79.9)		25	386.3	(88.0)		27	.00	.97	.01
Mood		306.7	(80.3)		25	284.3	(64.9)		27	1.23	.27	.28

(continued)

^ $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

♣ Child age is coded in actual months of age and is not adjusted for prematurity.

* Statistical analyses for the BDI was conducted using raw scores and these are presented in the table.

# Covariance adjusted means.

♠ Stanford Binet screening provided a composite IQ score.

♦ On the temperament scales, aspects of temperament are reported ;by parent on a scale of 1 to 6. Lower scores represent temperament aspects that are more easily handled.

$ 1 = Battelle Developmental Total Raw Score at Pretest, 2 = Days of care in NICU, 3 = Ethnicity of child, 4 = Education of father.

Table 5.14 (continued)

Comparison of Posttest Measures on Child Functioning for Children in Delayed and Early Groups in the Salt Lake Medically Fragile Study

	Covariates[$] In Order	Delayed Intervention				Early Intervention				ANCOVA F	P Value	ES[^]
		X̄	(SD)	Adj. X̄	n	X̄	(SD)	Adj. X̄	n			
42-MONTH TESTING (POSTTEST #3)												
Age in Months at Posttest #3[♣]		42.6	(.5)		26	42.7	(1.1)		26	.31	.58	.20
Battelle Developmental[*] Inventory (BDI) Raw Scores for:												
Personal/Social	1,2,3	100.8	(23.8)	102.4	26	105.0	(27.5)	103.5	26	.02	.89	.05
Adaptive Behavior	1,2,3	67.3	(14.6)	68.0	26	71.4	(12.5,	70.7	26	.48	.49	.18
Motor	1,2,3	89.7	(21.6)	91.5	26	93.1	(16.1)	91.3	26	.00	.96	-.01
Communication	1,2,3	53.3	(17.1)	54.8	26	58.1	(12.8)	56.6	26	.19	.67	.11
Cognitive	1,2,3	38.7	(10.6)	39.6	26	43.4	(9.6)	42.6	26	1.03	.31	.28
TOTAL	1,2,3	349.8	(79.2)	356.1	26	374.5	(59.4)	368.2	26	.38	.54	.15
Stanford Binet												
Composite IQ[♠]	1,2,3,4	95.0	(13.1)	94.5	24	103.5	(51.8)	102.4	25	.28	.60	.60
Preschool Language Scale[&]												
Auditory Comprehension Raw Score		20.3	(5.2)		24	22.1	(8.6)		26	.77	.39	.35
Verbal Abilities Raw Score		18.3	(6.0)		24	20.4	(6.6)		26	1.39	.25	.35
Language Quotient		48.7	(29.6)		24	51.5	(32.2)		26	.11	.75	.09
54-MONTH TESTING (POSTTEST #4)												
Age in Months at Posttest #4[♣]		54.5	(.7)		20	54.4	(.9)		19	.26	.61	-.14
Battelle Developmental[*] Inventory (BDI) Raw Scores for:												
Personal/Social	1,2,3	113.4	(33.7)	115.9	20	117.8	(20.1)	115.3	19	.01	.94	-.02
Adaptive Behavior	1,2,3	76.7	(20.2)	76.9	20	78.8	(12.1)	78.6	19	.09	.76	.08
Motor	1,2,3	100.4	(28.9)	102.4	20	106.5	(17.0)	104.5	19	.06	.80	.07
Communication	1,2,3	64.1	(20.3)	64.6	20	69.8	(12.8)	69.2	19	.70	.41	.23
Cognitive	1,2,3	50.4	(16.8)	51.1	20	56.1	(13.0)	55.4	19	.66	.42	.26
TOTAL	1,2,3	404.9	(112.8)	410.9	20	429.1	(59.7)	422.6	19	.17	.69	.10
Stanford Binet												
Composite IQ[♠]	1,2,3,4	92.6	(10.2)	91.7	18	88.7	(13.1)	89.5	18	.31	.58	-.22
Behavioral Style[♦] Questionnaire												
Activity		387.8	(66.7)		18	375.9	(63.1)		19	.31	.58	.18
Rhythmicity		318.4	(72.6)		18	307.5	(55.1)		19	.27	.61	.15
Approach		297.2	(85.3)		18	313.4	(87.0)		19	.33	.57	-.19
Adaptability		325.4	(97.3)		18	272.0	(68.0)		19	3.77	.06	.55
Intensity		430.9	(75.8)		18	429.4	(46.8)		19	.01	.94	.02
Mood		366.1	(88.3)		18	323.3	(70.8)		19	2.66	.11	.48
Preschool Language Scale[&]												
Auditory Comp. Raw Score		29.8	(5.0)		18	28.4	(7.5)		19	.44	.51	-.28
Verbal Abil. Raw Score		26.6	(6.4)		18	29.1	(7.0)		19	1.27	.27	.39
Language Quotient		100.9	(14.9)		18	97.3	(25.2)		19	.27	.61	-.24

[^]
$$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

[♣] Child age is coded in actual months of age and is not adjusted for prematurity.

[*] Statistical analyses for the BDI was conducted using raw scores and these are presented in the table.

[#] Covariance adjusted means.

[♠] Stanford Binet screening provided a composite IQ score.

[♦] On the temperament scales, aspects of temperament are reported ;by parent on a scale of 1 to 6. Lower scores represent temperament aspects that are more easily handled.

[$] 1 = Battelle Developmental Total Raw Score at Pretest, 2 = Days of care in NICU, 3 = Ethnicity of child, 4 = Education of father.

[&] Preschool Language Scale provides subscores of auditory comprehension and verbal abilities and a composite language quotient. Higher scores are better.

of age. On all of the child outcome measures, the two groups scored remarkably similarly. Only one statistically significant difference was found out of over 50 comparisons across posttests, and it is not surprising to find at least one difference in this number of comparisons. In sum, these two groups appear to be developing very comparably on development, IQ, temperament or behavioral style, and language.

However, within this sample of infants who experienced IVH at birth, there is great diversity in development. Battelle developmental quotients (age equivalent scores ÷ chronological age x 100) vary from approximately 10 to 100. The median developmental quotients for Posttests #1, #2, #3, and #4 range from 82 to 88. Approximately 25% of the children have delays of 30 points, or two standard deviations below the mean. The Stanford Binet Screening scores at Posttest #2, #3, and #4 indicate slightly higher abilities with the scores ranging from approximately 80 to 120, but all the children did not take the Stanford Binet. At each posttest, it was not appropriate to administer this scale to the children with very severe delays.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Although the intervention was not focused at parent support or parent stress, it seems possible that by providing sensory motor intervention when needed with the parent watching, and particularly after 18 months of age, by visiting the home to monitor and discuss child progress and suggest activities, the mother's parenting stress might decrease and her perception of social support might increase. The Family Support Scale measures support from professionals as well as from family members, neighbors, and others. Results of the ANCOVA did not support this prediction; no significant differences between the early and delayed intervention groups on family support or other outcome measures of family functioning were found at any of the posttests (see Table 5.15), except for child-related stress and family adaptation at Posttest #4. These differences might also be due to chance, since the findings were not replicated at other posttests. It should be remembered that the sample for this cohort is not yet complete, and differences might well disappear when all subjects have been tested.

The parents in the early intervention group did consistently, across posttests, report somewhat less parenting stress than did the parents in the delayed intervention group as the percentile scores and effect sizes on Table 5.15 indicate, but the stress felt by both groups was well within the normal range. They also reported slightly more social support, as indicated by the positive effect size signs and the percentiles. Likewise, no statistically significant differences were found on the measures of family adaptability and cohesion. These scores remained stable across posttests for both groups and lay midway in their respective scales (Olson, 1991).

Other Analyses

Parent-child interaction. Theoretically, the intervention delivered by the physical therapist or the home visitor might have influenced the way the mother interacted with the child. It is also generally accepted that parent behaviors influence child outcomes. For these two reasons, parent-child interaction behaviors were observed and videotaped. Parent-child interaction videotapes were collected for 33 of the children when the children were 12 months-of-age and 44 were collected when they were 30 months-of-age.

The 12-month videotapes were coded with the Parent/Caregiver Involvement Scale (PCIS; Farran, Kasari, Comfort, & Jay, 1986) and the 30-month videotapes were coded with the Parent Behavior Rating Scale (PBRS) (Mahoney, 1988). The coding for both scales was under the direction of their respective authors.

Table 5.15

Comparison of Posttest Measures of Family Functioning of Delayed Intervention and Early Intervention groups in the Salt Lake Medically Fragile Study

		Delayed Intervention					Early Intervention							
Variable	Covariates§	$\bar{X}$	(SD)	Adj.$\bar{X}$[#]	%ile	n	$\bar{X}$	(SD)	Adj.$\bar{X}$[#]	%ile	n	ANCOVA F	p Value	ES^
18-MONTH TESTING (POSTTEST #1)														
● **Parent Stress Index**‡														
Child Related (range 47 - 235)		102.3	(13.3)		61	28	100.5	(15.6)		57	29	.35	.56	.14
Other Related (range 54 - 270)	0,1	129.1	(29.8)	128.4	63	28	121.2	(22.8)	121.9	52	29	.99	.33	.22
Total (range 101 to 505)	2,3	222.9	(41.1)	221.2	50	28	221.7	(33.2)	223.2	53	29	.04	.84	.05
● **Family Support Scale**& **(FSS)**		29.3	(7.2)		56	28	31.6	(13.1)		66	27	.67	.42	.32
● **Family Adaptation and Cohesion**+ **Evaluation Scales (FACES)**														
Adaptability (range 10 to 50)		24.0	(5.3)			28	23.3	(6.6)			28	.22	.64	-.14
Cohesion (range 10 to 50)	4,5	41.4	(5.2)	41.9		28	43.8	(7.0)	43.2		28	.77	.39	.25
30-MONTH TESTING (POSTTEST #2)														
● **Parent Stress Index**‡														
Child Related (range 47 to 235)		102.3	(16.8)		60	27	100.2	(20.4)		55	29	.17	.68	.12
Other Related (range 54 to 270)		129.0	(22.8)		65	27	119.5	(24.2)		48	29	2.29	.14	.42
Total (101 to 505)		231.3	(32.6)		63	27	219.8	(38.6)		49	29	1.45	.23	.35
● **Family Support Scale**& **(FSS)**		29.4	(10.1)		57	27	31.4	(11.2)		64	29	.46	.50	.19
● **Family Adaptation and Cohesion**+ **Evaluation Scales (FACES)**														
Adaptability (range 10 to 50)		24.8	(7.3)			27	24.0	(5.1)			29	.20	.66	-.11
Cohesion (range 50 to 50)		41.7	(5.1)			27	42.6	(4.8)			29	.45	.51	.18

(continued)

$$^{\wedge}\text{ES} = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

[#] Covariance adjusted means

[&] Analyses for the FSS is based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 854 families with children with disabilities).

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[‡] Analysis for the PSI are based on raw scores. Lower scores are considered better. Both scales provide norms. High percentiles on the PSI represent more stress.

[§] 0 = total income; 1 = Mother's hours of work outside of home; 2 = Mother's occupation; 3 = Father's age; 4 = Educational level of mother; 5 = Number of adults living in the home.

Table 5.15 (continued)

Comparison of Posttest Measures of Family Functioning of Delayed Intervention and Early Intervention groups in the Salt Lake Medically Fragile Study

Variable	Covariates[$]	Delayed Intervention					Early Intervention					ANCOVA F	p Value	ES[^]
		$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n			
42-MONTH TESTING (POSTTEST #3)														
● **Parent Stress Index**[♦]														
Child Related (range 47 to 235)		105.6	(19.4)		67	25	101.8	(16.8)		60	25	.53	.47	.19
Other Related (range 54 to 270)		125.1	(25.2)		58	25	124.9	(24.2)		58	25	.00	.97	.01
Total (range 101 to 505)		230.7	(38.1)		63	25	226.7	(34.4)		59	25	.15	.70	.10
● **Family Support Scale**[&] **(FSS)**		28.3	(9.8)		52	25	30.2	(10.1)		59	25	.46	.50	.19
● **Family Adaptation and Cohesion**[+] **Evaluation Scales (FACES)**														
Adaptability (range 10 to 50)		23.4	(4.1)			25	24.6	(4.1)			25	1.12	.30	.29
Cohesion (range 10 to 50)		41.1	(5.0)			25	41.3	(4.6)			25	.02	.88	.04
54-MONTH TESTING (POSTTEST #4)														
● **Parent Stress Index**[♦]														
Child Related (range 47 to 235)		116.1	(23.2)		85	19	101.0	(20.0)		57	18	4.52	.04	.65
Other Related (range 54 to 270)		129.2	(20.9)		65	19	123.6	(28.5)		56	18	.47	.50	.27
Total (range 101 to 505)		251.7	(31.3)		76	19	229.4	(43.2)		56	18	2.25	.14	.51
● **Family Support Scale**[&] **(FSS)**		30.1	(11.1)		59	19	31.9	(9.1)		67	19	.29	.59	.16
● **Family Adaptation and Cohesion**[+] **Evaluation Scales (FACES)**														
Adaptability (range 10 to 50)		21.8	(5.1)			19	25.1	(5.9)			19	3.19	.08	.65
Cohesion (range 10 to 50)		41.5	(4.3)			19	42.9	(3.2)			19	1.35	.25	.33

[^] $$\text{ES} = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

[#] Covariance adjusted means

[&] Analyses for the FSS is based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 854 families with children with disabilities).

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[♦] Analysis for the PSI are based on raw scores. Lower scores are considered better. Both scales provide norms. High percentiles on the PSI represent more stress.

[$] 0 = total income; 1 = Mother's hours of work outside of home; 2 = Mother's occupation; 3 = Father's age; 4 = Educational level of mother; 5 = Number of adults living in the home.

Both the PCIS and PBRS are behavioral rating systems for the parents' interaction behaviors. The PCIS scale measures 11 parent or caregiver behaviors. These scales include: physical involvement, verbal involvement, responsiveness, play interaction, teaching behavior, control, directives, relationship among activities in which caregiver was involved, positive statements, negative statements/discipline, and goal setting. Each of these caregiver behaviors were rated separately for amount of behavior, quality of behavior, and appropriateness of behavior on 5-point Likert-type scales. The amount scores for the 11 variables were summed and averaged resulting in an amount score. Similarly, quality and appropriateness were rated.

The PBRS (Mahoney) rates 12 parental behaviors including warmth, expressiveness, enjoyment, acceptance, sensitivity to child's interest, responsivity, effectiveness, directiveness, achievement orientation, pace, inventiveness, and verbal praise. Based on a principle axis factor analysis (using the SPSSPC) of these 12 variables for 462 observations of parent-child interaction from the EIRI studies, 3 factors were identified which together accounted for 61.8% of the variance. Factor 1, Affective Relationship with Child, included expressiveness toward child, enjoyment of interacting with child, and acceptance of child's behaviors. Factor 2, Orientation to Child's Interests and Behaviors, included sensitivity to child's interests, responsivity and effectiveness of parent to engage child in play interaction. Factor 3, Performance Orientation, included achievement orientation, pace of parent's behaviors and intensity and frequency of directiveness. Two variables, verbal praise and inventiveness, did not load high enough to be included in any factor.

The two groups appear very similar at the 12- and 30-month assessments (see Table 5.16.) No statistical differences are seen in the parent behaviors as coded by either system. Because the two groups are so similar in parent interaction behaviors, it seems unlikely that parent behaviors are affecting or explain the outcomes of the early intervention vs. the delayed intervention comparisons.

Table 5.16

Comparison of Posttest Measures of Parent Interaction Behaviors of Parents in the Delayed Intervention and Early Intervention Groups in the Salt Lake Medically Fragile Study

		Delayed Intervention				Early Intervention						
Variables	Covariates&	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	P Value	ES^
PUSTTEST #1 Parent Caregiver Interaction Scale (Farran)												
● **Average Rating**												
Amount	0,1	2.7	(.7)	2.7	16	2.7	(.4)	2.7	16	.04	.85	.00
Quality	0	3.8	(.6)	3.8	16	3.9	(.7)	3.8	16	.06	.80	.00
Appropriateness		3.8	(.6)		16	3.7	(.7)		17	.05	.83	-.17
POSTTEST #2 Parent Behavior Rating Scale (Mahoney)												
● **Factors**												
Affective Relationship	2,3	3.3	(.7)	3.2	23	3.1	(.7)	3.1	21	.09	.77	-.14
Child Orientation	2,3	3.5	(.3)	3.6	23	3.4	(.7)	3.4	21	.71	.40	-.67
Performance Orientation	1,2	3.2	(.6)	3.2	23	3.1	(.5)	3.1	21	.29	.59	-.17

Covariance adjusted means.

& Covariates: 0 = Days of care in NICU; 1 = Grade of Intraventricular Hemorrhage; 2 = Child's age at pretest; 3 = Battelle Total Raw Score.

^ $$ES = \frac{\text{Early Intervention adj. } \bar{x} - \text{Delayed Intervention adj. } \bar{x}}{\text{Delayed Intervention SD}}$$

Videotaped assessment of motor functioning. A videotaped procedure was used to capture spontaneous motor behavior in 12-month-old infants. This sequence encourages the infant to perform a series of 13 movement patterns which are typically attained during the first year of life. Included in the movement patterns elicited are rolling over, crawling, sitting up, pulling to stand, cruising, walking, squatting, and reaching, among others. The infant's performance was rated using a three-point rating scale which assesses qualities of movement patterns such as weight shift, balance, coordination, reflex integration, body alignment, symmetry, and trunk rotation.

Twenty-seven infants were assessed with the Videotaped Assessment of Motor Functioning at 12 months corrected ages. These were rated using the Motor Sequence Rating Scale (Peterson & Miller, 1985). The total score of the motor rating was correlated with the fine motor, gross motor, motor total, and cognitive subdomain scores from the posttestings at 18 and 30 months, CCA. All the correlations are statistically significantly high, especially for the gross motor correlation. See Table 5.17.

Table 5.17

Correlations of Battelle Developmental Inventory Raw Scores with Videotaped Motor Ratings at 18 and 30 Months Corrected Chronological Age for the Salt Lake City Medically Fragile Study

	18 Month CCA			30 Month CCA		
Variable	r	p	n	r	p	n
Fine Motor	.69	.00	27	.71	.00	24
Gross Motor	.89	.00	27	.91	.00	24
Motor Total	.85	.00	27	.87	.00	24
Cognitive	.59	.00	27	.63	.00	24
TOTAL	.63	.00	27	.70	.00	24

Because this assessment was being developed, not all the videotapes were adequate to be scored with the rating system. Twenty-seven of the tapes were usable and these did not happen to be equally divided between the early and delayed intervention groups. Therefore, the motor functioning of the early intervention and the delayed intervention groups was not compared.

Conclusions

Intervention for infants born "at risk" with IVH was the focus of this study. Infants with IVH were randomly assigned to two groups at 3-months adjusted age. One group (early intervention) was monitored monthly or bi-monthly and received sensory motor intervention needed until the infants were 18 months old. The other group (delayed intervention), after 18 months adjusted age along with the early intervention group, received home-based developmental intervention plus motor intervention if needed. Some of the children have now completed their 66-month (actual age) testing, while others have just completed their 30-month testing. This longitudinal study was methodologically sound with random assignment to treatment, careful treatment verification measures, matched samples, pre- and post-measurement, "blind" assessment by certified testers, and multiple measures of child and family functioning. Results of Posttests #1 and #2 are completed and Posttests #3 and 4 are preliminary.

The results of the statistical analyses of the posttest data across posttests indicated that there were no statistically significant differences between groups on the measures of child functioning. The performance of the two groups was very similar on all measures of child development. Within the entire sample, there is great diversity in performance on the measures. Many of the children are developing normally or nearly normally, but some are experiencing severe delays.

Analysis of the data collected on family functioning demonstrated that the families in the two groups have thus far experienced comparable parenting stress, family social support and are functioning comparably in terms of adaptability and cohesion. Only two statistically significant posttest differences at Posttest #4 were found. These isolated differences may be due to the fact that the sample at Posttest #4 is, as yet, incomplete. It may also be important that although the differences were not statistically significant (except for child-related stress at

Posttest #4), the families in the early intervention group reported somewhat less stress and somewhat more social support across all four posttests.

Nevertheless, the preliminary conclusion from this study, must be that to this date earlier intervention has not resulted in greater benefits to either children or families. Those children who received earlier intervention did not appear to do substantially better on measures of child development than children who received the later intervention. Likewise, the parents did not report less stress or better family functioning.

The results of the current study present a contrast to results reported by Resnick et al. (1987, 1988), who found significant differences favoring infants receiving early intervention services. This study did, however, offer preliminary support and can be better compared to the findings of the Infant Health and Development project (1990) which found no treatment effects in a population similar to the one in this study even though the intervention was very intensive.

It is still possible that differences between treatment groups will not be apparent until the subjects in this study are older. For example, Rauh et al. (1988) found that significant differences between experimental and control groups did not appear until 36 and 48 months, as did the Infant Health and Development Study (1990). Bennett (1987) reported that some less obvious disabilities were not apparent in children biologically at-risk for disabilities until they reached school age.

Issues related to the intensity and comprehensiveness of the intervention also might be considered. However, at the present time, we must conclude that in this study, there were no apparent benefits accruing to those who received interventions beginning at three months compared to those infants who received interventions beginning at 18 months.

CHARLESTON, SOUTH CAROLINA IVH PROJECT

Project #6

COMPARISON: Infants with Grades I, II, III, and IV Intraventricular Hemorrhage (IVH)--Services begun at 3 months adjusted age versus services at 12 months.

LOCAL CONTACT PERSON: Conway Saylor, Ph.D.; Medical University of South Carolina

EIRI COORDINATOR: Conway Saylor, Ph.D.

LOCATION: Charleston, South Carolina

DATE OF REPORT: 11-12-1991

Rationale for the Study

One of the primary contributors to infant mortality is low birthweight (LBW). In the USA, 6.8% of all newborn babies are LBW (weighing 2500 g or less at birth), and about 1.2% are very-low birthweight (VLBW) (weighing 1500 g or less at birth). This amounts to approximately 225,000 low-birthweight infants per year (National Center for Health Statistics, 1989).

Forty percent of low birthweight infants (or approximately 90,000 infants per year) suffer periventricular-intraventricular hemorrhages (PVH-IVH) within 72 hours of birth. These hemorrhages produce abnormal bleeding from cranial capillaries and result in different degrees of neurological damage based upon the severity of the hemorrhage (Volpe, 1981). Brain-imaging procedures such as real-time ultrasonography and computed tomography (CT) scanning are used to make a positive identification of IVH and to classify the hemorrhage into one of four grades of severity, with Grade

I IVH the most mild form of hemorrhage, and Grade IV the most severe (Papile et al., 1978). Dramatic clinical symptoms such as seizures, loss of muscle tonus, cessation of breathing, and unreactive pupils, may mark the onset of IVH; however, at times IVH is clinically silent (Tarby & Volpe, 1982). The importance of PVH-IVH as a major health problem is underscored by the following statistics (Volpe, 1987):

For each 1,000 LBW infants born--

- 400 suffer PVH-IVH
- 100 of the 400 (25%) die immediately
- 85 of the remaining 300 (28%) suffer major neuropsychological impairment

Information as to the future developmental progress of PVH-IVH survivors is somewhat limited and controversial (Hynd et al., 1984). Williamson et al. (1982) found that 29% of Grade I and II IVH LBW infants exhibited moderate disabilities by the age of 3, whereas Papile et al. (1983) found that only 15% of such children could be diagnosed as having these disabilities. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe disabilities, such as cerebral palsy, by the third year of life. Sostek et al. (1987) concluded that the severity of IVH did not predict the infant's developmental progress at 2 years of age; however 40% of the infants in that study showed significant delays at 2 years. But, Bozynski et al. (1984) indicated that these infants are at especially high risk for later motor problems. In spite of compelling data that these infants are at high risk, and increasing in number, there are too few longitudinal studies which carefully document the behavioral developmental course of these infants, much less the impact o intervention on that course. (Vohr & Garcia-Coll, 1988) This study represents a significant expansion over previous studies of the low birthweight infants with IVH in that in involves longitudinal follow up of a relatively large group of them after random assignment to either early or delayed intervention. The details of this study will follow after brief mention of some of the pertinent literature.

Review of Selected Literature

Although there is a fair amount of research on interventions for premature low-birthweight babies (see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey et al., 1984; Sandall, 1990; for reviews), most have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention; and virtually all have excluded children who have suffered major neurological insults such as IVH. An exception is a study by Resnick et al., 1987-88, who included neurologically impaired infants.

Two recent studies examined the effectiveness of early sensory motor therapy for infants at-risk for developmental delays. Goodman et al. (1985) divided infants into high and low risk for motor problems based on an early assessment, and alternately assigned them to control and intervention groups. A program of weekly home visits began for the intervention group at three months of age. The results of this study indicated that the intervention group did not benefit from the intensive intervention. One methodological flaw with this study that was not clearly discussed in the report was the fact that infants in the control group who started to develop motor problems were removed from the control group and given intervention. This protocol might have resulted in those infants who could have demonstrated the efficacy of the intervention being removed from the analyses.

Palmer et al. (1988) randomly assigned 48 infants with mild and severe spastic diplegia to groups receiving either 12 months of physical therapy or 6 months of infant stimulation followed by 6 months of physical therapy. After 6 months of therapy, the infants in the physical therapy group had lower mean motor scores and were less likely to walk. These differences persisted after 12 months of therapy. In addition, there were no significant differences in the number of infants with contractures or needing bracing, and the physical therapy group had lower mental development scores. The major difference between this study and the current study is the enrollment of children who already show motor problems, rather than those at risk for development of these problems.

Two highly intensive intervention programs produced somewhat conflicting results. Resnick et al., 1987 evaluated the effects of a multidisciplinary infant development program on low birthweight infants at 12 and 24 months of age and found significant differences favoring the experimental group on both physical and mental indices. The Infant Health and Development Program (1990) found similar differences at 36 months for all infants except those with IQ scores lower than 70. These infants failed to demonstrate any intervention effects. In sum, further research in this area is clearly indicated.

Overview of Study

There are no studies to date which examine parameters such as age-of-start in a controlled fashion with this population. There has been literature describing components of "state of the art" intervention for families of infants with handicapping conditions (e.g. McDonnell & Hardman, 1988), and this intervention incorporated most of the recommended components (or review see Saylor, Levkoff, & Eklsnin, 1989). However, there is clearly a need to put our "best practice" techniques to the test in controlled, longitudinal studies such as the one that follows. As noted earlier, intervention programs for low-birthweight infants have generally focused on in-hospital stimulation or parent training intervention, and most have excluded children who have suffered major neurological insults such as IVH (for reviews see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey et al., 1984). At issue for this study are the effects and related costs of beginning intervention at different ages for infants who have serious medical problems and who routinely spend up to three months in intensive care units.

The specific comparison for this study was between infants receiving intensive motor-development oriented intervention beginning at 3 months corrected age and infants who began receiving comprehensive developmental services at 12 months of age. This comparison was chosen because a high proportion of the developmental problems encountered by these infants are motor development related. Since these infants routinely receive only medical follow-up until a particular problem or delay is noted, this study provided a good opportunity to test the age-at-start hypothesis.

Methods

This study was implemented in collaboration with the Departments of Pediatrics and Psychiatry of the Medical University of South Carolina in Charleston, South Carolina. The full-time staff of this intervention project consisted of a home interventionist and two physical therapists. The project was overseen on a part-time basis by a director and supported on a part-time basis by a Post Doctoral Fellow who served as coordinator, a diagnostician, and a secretary.

Subjects

The sample was composed of 66 infants recruited from both urban and rural areas around Charleston. Subject recruitment was closed in October, 1988. Of 66 originally recruited, 64 infants have received a pretest and a one-year posttest, 58 infants have had their two-year posttest, and 53 infants their three-year posttest.

Recruitment and random assignment. Infants qualified for participation in the research if they had been patients in the NICU at the Medical University of South Carolina, if they had experienced intraventricular hemorrhage (IVH) or had a birthweight of less than 1000 g, and if they resided in the catchment area for treatment (60-mile radius). For purposes of assignment, severity of IVH was divided into mild (Grades I and II IVH) and severe (Grades III and IV IVH) categories.

Parents of eligible infants were contacted while the infant was still in the NICU, and subsequent telephone contact was made shortly after discharge. For each infant who met the study criteria, parents were required to indicate willingness to participate in either the experimental or the control conditions, depending upon where they were placed by random assignment. Infants with IVH were randomly assigned to treatment (Early) or control (Delayed) conditions by a roll of a four-sided die after stratification by severity of IVH (mild, Grade I or II, or Grade III or IV, severe) and birthweight (under 1000 g or over 1000 g). Those infants who had birthweights under 1000 g, but did not have IVH, were randomly assigned to treatment or control in a 5th cell.

The only people who knew the actual order of eligibility and enrollment of subjects were the site director and the research coordinator. The dates on which infants were born were the basis for sequence of enrollment, and infants were assigned to experimental conditions in order of eligibility.

Attrition. A total of 66 subjects were originally enrolled and pretested in this project. Two subjects withdrew their consent to participate immediately after being pre-tested and were thus never meaningful participants in the study. The remaining 64 of the infants enrolled were still in the program for the first post-test, 58 were seen for the second post-test, and 53 for the third post-test. Of the 13 who were not available by year three, two dropped out immediately as described above, three died, two were lost when foster placement was repeatedly re-assigned, three relocated without giving the project notice or address information (two after a major hurricane in which their homes were totally destroyed), and three declined to participate and/or failed more than four appointments and refused our offer to come to their home to do testing. Thus, the present findings are based on 98% of the originally enrolled subjects at post-test one, 88% at post-test two, and 80% at post-test three. A series of t-tests showed no significant differences on medical or demographic variables for the 53 subjects completing year three and the 13 lost to follow up.

Medical and demographic characteristics. Table 6.1 summarizes the available demographic data for the 64 infants who represented the initial study participants. All of the children were from families who resided within sixty miles of Medical University of South Carolina in Charleston, South Carolina. This included populations from isolated rural areas, small towns, suburban areas, and the Charleston Metropolitan area. The ethnic background of the sample was approximately 65% Black and 35% Caucasian. All of the participants live in homes where English was the primary language, and there were slightly more two parent than single parent families (57% vs 43%). Forty-one percent of the enrolled families were receiving public assistance. Only one variable differed significantly between the early and delayed intervention groups. There was a higher proportion of males in the delayed intervention group than in the early intervention group (68% versus 30%, respectively).

Table 6.1 and 6.2 display the comparisons medical and demographic data of the early versus delayed intervention groups. The only statistically significant difference between groups was that there were more males than females in the Early Intervention group. Although the differences were not statistically significant, the effect size magnitude called our attention to three medical variable group differences. Specifically, it was noted that the Early Intervention group had a lower mean gestational age (GA), a higher number of days on ventilation, and a higher percent of cases with Retinopathy of Prematurity (ROP). Because of their potential relationship to developmental outcomes, the correlations between each of these variables (GA,ROP, days on vent, gender) and developmental scores (Battelle and MCDI's at one, two, and three years) were considered so that their potential role as covariates could be determined. Correlations ranged from .02 to .21, with none

Table 6.1

South Carolina Medically Fragile Study: Comparability of Demographic Characteristics for subjects in Delayed vs Early Groups

	Groups							
	Delayed Intervention			Early Intervention				
Variable	$\bar{X}$	(SD)	N	$\bar{X}$	(SD)	N	p Value	ES♣
• Age of mother in years	29.3	(7.4)	30	28.0	(6.1)	34	.45	-.18
• Age of father in years	30.8	(6.7)	28	31.1	(6.5)	31	.87	.04
• Percent male*	30%		30	68%		34	.00	.75
• Years of education for mother	12.9	(2.0)	26	12.3	(2.1)	34	.27	-.30
• Years of education for father	12.7	(2.0)	23	12.4	(1.9)	31	.63	-.15
• Percent with both parents* living at home	55%		29	59%		34	.77	.07
• Percent of children who* are Caucasian	33%		30	38%		34	.71	.09
• Hours per week mother employed	17.8	(19.5)	17	14.3	(18.3)	23	.57	.18
• Hours per week father employed	39.9	(13.4)	18	41.0	(17.7)	20	.84	.08
• Percent of mothers* employed as technical managerial of above	11%		27	6%		34	.50	-.17
• Percent of fathers* employed as technical managerial of above	16%		25	4%		27	.19	-.35
• Total household income	$18,125	($19,650)	28	$14,662	($11,886)	34	.42	-.18
• Percent receiving public* assistance	41%		27	39%		33	.91	-.03
• Percent with mother as* primary caregiver	89%		28	94%		34	.53	.16
• Percent of children in* daycare more than 5 hours per week	40%		30	24%		34	.17	.33
• Number of siblings	1.1	(1.6)	28	1.1	(1.3)	34	.89	.00
• Percent with English* as primary language	100		29	100		34		

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) on the $\bar{x}$ scores, divided by the standard deviation of the Delayed Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored as "0."

Table 6.2

South Carolina Medically Fragile Study: Comparability of Groups on Medical Characteristics

	Subjects Included in First Posttest Analyses (N = 56)							
	Delayed Intervention			Early Intervention				
Variable	$\bar{X}$	(SD)	N	$\bar{X}$	(SD)	N	p Value	ES
• Birthweight (g)	1231	(518)	30	1107	(357)	34	.27	-.24
• Grade of IVH (% with Grade III or IV)	48		30	62		34	.27	-.27
• Gestational Age (Weeks)	30.3	(3.2)	30	28.9	(2.6)	34	.08	-.44
• Days on Ventilator	14.8	(23.7)	30	20.4	(23.4)	34	.34	.24
• Apnea (%)	43%		30	56%		34	.34	.23
• Seizures (%)	7%		30	15%		34	.39	.21
• Respiratory Distress Syndrome (%)	63%		30	79%		34	.17	.34
• Bronchopulmonary Dysplasia (%)	36%		30	41%		34	.73	.08
• Retinopathy of Prematurity (%)	30%		30	59%		34	.02	.56

of the relationships even approaching significance. Thus, subsequent analyses treated groups as though they were comparable on all medical and demographic characteristics.

Alternative Intervention Programs

The comparison for this study was of an early versus delayed intervention program. Intervention occurred in two phases. During Phase I, the subjects assigned to the Early Intervention group received a sensorimotor intervention beginning when the infants were 3 months of age, and the Delayed Intervention group received the routine medical follow-up services available to the community in general. In Phase

II, the delayed intervention phase, all infants received home intervention services and sensorimotor services as needed.

Before the implementation of this project, all infants who were in Neonatal Intensive Care Units were referred to the South Carolina State Department of Health Neonatal Follow-up Clinic and received routine medical follow-up from private physicians or clinics. Previous funding for these services was provided by the South Carolina Department of Health, for those utilizing the follow-up service; or by patient self-pay, for those using private physicians or clinics. These services remained the standard level of care for all infants in the treatment area during the period described in this report. Infants who were assigned to the control group for this project typically received no other services during the first phase of the study, as very few services were available. However, parents were able to access services in the community if they desired. Parents were queried about services they have accessed during the time period of the study, and these results are described later.

During both the early and delayed phases of the intervention project, the types of intervention services received were based on the Curriculum and Monitoring System (CAMS) (Casto, 1979). The Curriculum and Monitoring Systems (CAMS) is an early intervention curriculum system designed to meet the educational needs of young children with disabilities served by the Multi-Agency Project for Preschoolers (MAPPS). The project collected data attesting to the efficacy of the program and was validated as an exemplary program for national dissemination by the Joint Dissemination Review Panel (JDRP) of the U. S. Department of Education. It was revalidated in 1985. MAPPS is one of only 21 early intervention projects validated by the JDRP. MAPPS is also a National Diffusion Network (NDN) program and has replication sites nationwide.

Each of the curriculum programs is printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. With training, CAMS can be used by parents, teachers, and paraprofessionals in the home or an institutional/school setting.

The CAMS is designed to stimulate optimal development by programs in five areas: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development. The motor domain that was the primary domain addressed during the early intervention. Beginning at one year, both delayed and early intervention subjects received intervention in all five domains.

The ***Receptive Language Program*** teaches the student skills that do not require him to talk but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The ***Expressive Language Program*** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building articulation.

The ***Motor Program*** is designed to teach gross and fine motor skills. The program stimulates normal motor development, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The ***Self-Help Program*** is designed to teach basic skills for self care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The ***Social-Emotional Program*** is designed to teach basic social-emotional skills to both normal and developmentally delayed children. The program, which is sequenced developmentally, begins with teaching a child to respond to a person and proceeds through teaching him to handle frustration and exhibit self-control.

Early Intervention Program - First Year

Between 3 and 12 months corrected age, subjects in the early intervention group were scheduled for twice-monthly one-hour sessions with the physical therapist. The therapist worked with the infant and parents using the Motor Program of the CAMS (Casto, 1979). First, a placement test was administered in the motor skills domain to determine which objectives should be offered to the child. Second, curriculum books were provided with developmentally sequenced objectives and activities for assisting in a child's gross and fine motor development for ages birth to 5 years of age. Each child's program was individualized.

A typical intervention session was conducted by a therapist who worked with the child, with the parent present. The physical therapist also instructed the parent on exercises that the child could do at home, and the parent practiced and demonstrated competence on the exercises before beginning home intervention. The parents were requested to work with the child at home for at least 20 minutes per day, 5 days per week, on techniques they learned in the intervention sessions. The physical therapist telephoned the parent on weeks they did not meet to answer questions and provide guidance on implementation of intervention techniques. Attendance and progress were monitored on an ongoing basis by the physical therapist's progress notes, and the motor program placement test checklist were updated as goals were met.

Second Year Intervention Program

At 12 months corrected age, all subjects in the early and delayed intervention groups began expanded intervention programs utilizing all five domains of the CAMS programs. A child development specialist administered the CAMS placement tests, determined developmental levels, and set appropriate goals for intervention in each domain. All subjects were given placement tests in motor, social-emotional, self-help, receptive language, and expressive language domains and then participated in an expanded intervention program, which included weekly contacts with an infant specialist. The interventionist alternated twice monthly home visits with telephone contacts and encouraged parents to attend monthly center based sessions for parent-infant dyads.

A child development specialist was scheduled to meet with parent and child for one-hour twice each month and provided intervention. For each session, an objective was determined for the child, the child development specialist modeled the training for the parent, and the parent demonstrated the technique. The parent was asked to spend 20 minutes each day, 5 days each week providing similar intervention with their child at home. The child development specialist called the parent via telephone weekly between home visits to check on progress and answer questions. When the child was seen for the next session, the child development specialist had the parent elicit the new behavior from the child. If the child demonstrated competence in that area, a new objective was chosen and modeled for the parent.

For example, the objective for a child might be to point out facial features. The specialist would teach the parent an exercise to teach the child facial features. At the next meeting, the specialist would have the child point out facial features. If the child showed competence in that area, a new objective would be established. Depending on their needs, some children would have objectives in several domains, others in only one. Recommendations were also provided to parents regarding problems or concerns such as toileting, feeding, or misbehavior.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, s/he was referred to a physical therapist for motor intervention through the usual community or MUSC-based programs. Those children in the early intervention group who still required motor services either continued meeting with the physical therapist or was referred on as above. If a child who received motor services in the early intervention group no longer required those services, those services were discontinued and home intervention was delivered based on the needs of the child.

In addition to the goals centered on infant developmental progress, individual family goals were set and addressed utilizing processes which eventually were formalized as IFSP's (Individualized Family Service Plans). Especially after the child's second birthday, the IFSP's tended to include goals related to qualifying for and seeking funding for appropriate additional services. Children were transitioned out of the program between their second and third birthdays, depending on the availability of needed services and the lag time in the assessment and referral process.

Treatment Verification

White et al. (1987) discussed two important issues in verifying that an early intervention program occurred as it was intended. First, delivery of intervention must be examined to ascertain that the program which is being delivered is the same as that which was described in the methodology of the proposal and reports. Second, the extent to which infants and their parents received and participated in the program must be examined. The SC-IVH project implemented several procedures to verify that the intervention was implemented as intended.

The first treatment verification procedure was a formal site review, conducted annually. The SC-IVH site reviews were conducted on September 20-21, 1987, April 25, 1988, and June 1, 1989. The purpose of the site review was to collect information regarding the nature and quality of the early intervention services delivered at this site. Documentation of treatment implementation occurred to ascertain that the intervention services were provided as intended and that the project remained faithful to the research protocol. The site review was conducted according to procedures described in the Guide for Site Reviews of EIRI Research Sites, in the Treatment Verification Handbook for Research Sites (EIRI, 1987). The site was rated excellent on all aspects of the evaluation at all visits, except for implementation of formal Individualized Family Service Plans. Although family issues were being addressed, S.C. had not formalized its guidelines for the IFSP, and there was no document of this specific title and format on the charts of the oldest participants in the projects. A final site review was conducted in May 1990, to discuss the evaluation and intervention for the infants under the EIRI protocol.

In addition to verifying that the intervention program continued to be implemented as originally intended, three methods were used to examine parental participation in the intervention. First, the interventionists tracked the number of center and home based visits that an infant attended during each month. Second, the interventionists asked the parents once a month to estimate the amount of time during the past week that they spent working with their infant on activities suggested by the interventionist. When the interventionist recorded this information, they also rated the parents' accuracy of estimation. Finally, the interventionist were asked to rate the parents once a year on three aspects of their participation in the intervention program. The interventionists used three point scales (1 = low, 2 = average, and 3 = high) to rate the parents' attendance of scheduled appointments, their knowledge of the information that the intervention was designed to provide, and their support of the goals and methods of the intervention program. Table 6.3 represents the data from these treatment verification methods.

Additional treatment verification was undertaken during 1990-1991. A structured interview soliciting both quantitative and qualitative data about treatment participation was administered by a Post-doctoral level, skilled clinical researcher to 47 of the 53 families, still active in the study. In addition to soliciting retrospective data about level of participation in this program and reasons for transition/termination, the interviewer collected data about concurrent therapies and services accessed by the families, and got releases of information to verify and elaborate on information provided by parents. In the coming year, interview data will be followed-up, quantified, and analyzed relative to other treatment verification data and outcome data.

Table 6.3

Parent Participation in the Phase I Sensorimotor Intervention

Variables	n	$\bar{x}$	(SD)	Range	Minimum	Maximum
Percent of scheduled visits attended	29	64		1.03	17	120
Number of hours per month working with♦ interventionist	29	1.3	(.5)	2.06	.3	2.4
Number of Hours per week working with child on suggested activities (Parent Report)	16	2.2	(.7)	2.21	1.3	3.5
Interventionists' rating of accuracy of* parents' time report	16	2.3	(.6)	2	1	3
Interventionists' rating of quality of* parent participation						
1. Attendance	29	2.1	(.8)	2	1	3
2. Knowledge	29	2.2	(.7)	2	1	3
3. Support	29	2.2	(.8)	2	1	3

♦ Based on percentage of scheduled visits attended x 2 hours per visit.
* 1 = low, 2 = Average, 3 = high

Cost of Alternative Interventions

The cost of delayed versus early intervention was determined using the "ingredients" approach described by Levin (1983). The figures in Table 6.4 are based on actual expenses for each, including personnel, space, equipment, supplies and volunteer time. The cost per child for the Early Intervention group represents the accumulated costs of intervention from October 1986 to October 1988. For Early Intervention participants the total program cost was for two years, (from 3 months adjusted age) and two phases of intervention as outlined under the intervention program description. The cost per child for the Delayed Intervention group represents the cost for services from the date these children turned 12 months of age and services began until October 1988, the end of FY 1987-88. In Table 6.4, cost per child estimates in Years 1 and 2 are adjusted for inflation so that all figures

Table 6.4

Cost Per Child for South Carolina IVH Site (1990 Dollars)

Resources	Early Intervention	No Intervention
1. Undiscounted		
Agency Resources		
Direct Service Personnel	$3,140	$1,220
Administration		
Program	1,660	771
University	1,435	639
Occupancy	307	101
Equipment	56	17
Transportation	600	443
Materials/Supplies	146	74
Telephone	71	36
Subtotal	**$7,415**	**$3,301**
Contributed Resources		
Parent Time	2,500	1,221
Others	16	
Subtotal	**$2,516**	**$1,221**
TOTAL	***$9,931***	***$4,522***
2. Discounted at 3%:		
Total Agency Resources	8,237	3,607
Total Resources	11,029	4,941
3. Discounted at 5%:		
Total Agency Resources	8,822	3,821
Total Resources	11,809	5,235

* *Totals may not add up due to rounding errors.*

are comparable in 1990 constant dollars. In addition, at the bottom of Table 6.4, estimates are adjusted to reflect real discount rates of 3% and 5%.

To arrive at the cost per child, total program costs were determined for each group and divided by the number of children in the group: in Year 1, the total number of children receiving intervention was 24; in Year 2, 38 children (both treatment and control) were receiving services. As illustrated in Table 6.4, program costs included direct service and program and university administration, occupancy, equipment, transportation, materials and supplies, and telephone used for the respective groups.

Direct service personnel costs included wages and benefits for the physical therapist, and the interventionists. Each of these were pro-rated according to actual time spent on intervention-related activities. Program administrative costs included the pro-rated salaries and benefits for the psychologist, coordinator, interventionist, and secretary according to their time spent on administrative duties for the intervention. Research costs in this, and all other resource categories, naturally, were excluded. The university administrative cost was based on the university indirect rate for general, departmental, and sponsored projects administration (24%). Occupancy charges were calculated based on the University's rate per square foot for office space, utilities, maintenance, and insurance pro-rated according to program usage. Equipment costs included the cost of office furniture and intervention equipment. These costs were based on market replacement values for each item which are annualized at a rate which accounts for interest and depreciation and pro-rated according to program usage to determine the annual equipment cost. Agency transportation cost for home visits were calculated at $.21 per mile based on actual mileage. In addition, the project reimbursed several parents for bringing their child to the center for PT treatments in Year One.

Because the program relied heavily on parent participation for both home visits and conducting intervention with their own child in the home, the opportunity cost of parent time was also included. These costs are presented as "contributed resources" on Table 6.4. Parent time included time spent in (1) center and home visit sessions with either the physical therapist or the interventionist; and (2) intervention activities recommended by the program for each parent and child at home. Parents spent an average of 121.2 hours per year in session with professionals and conducting intervention activities at home. Parent time was assigned the value of

$9 per hour based on the average hourly earnings plus benefits for full-time work for women in the U.S.

Thus, for children entering the program at 3 months adjusted age and receiving two years of individualized intervention from both professionals and their professionally trained parents, the undiscounted cost of the program was $9,931 per child, while for children entering the program later at 12 months, the undiscounted cost was $4,522 including the value of parent time. The cost per child for intervention in Year 2 was less than Year 1 because of the greater emphasis on physical therapy in Year 1, which costs more than services from the interventionist. This served to reduce costs allowing the program to serve more children and further reduce the cost per child.

Data Collection

Data were collected for this study to determine the effects of intervention upon the child and the family. The assessment instruments were chosen to provide some consistency of data collection across sites, but also to provide information about children who experienced intraventricular hemorrhage at birth and the unique experiences of their families. In the subsequent section the measures of a local diagnostician who was unaware of the group membership of children or the specific purposes of the study was hired to administer the pre- and posttest measures. Testing was scheduled directly with the diagnostician by the site coordinator. Children were enrolled in this study in two cohorts. The first 18 children were enrolled before the full battery of pretest measures was finalized. Therefore, the pretest for these children consisted only of the Battelle Developmental Inventory (BDI). The next 45 children were enrolled after the full testing battery (described below) had been developed. Forty-five (70%) of the infants who reached the first posttest received the full assessment battery at pretest.

Recruitment, training, and monitoring of diagnosticians. All testers recruited for the study successfully completed the certification process required for administration of the Battelle Developmental Inventory. The training involved approximately 4 hour of independent study, 8 hours of group training, ana a minimum of 3 practice administrations with 85% interrater agreement required. All of the diagnosticians has a master's degree in Clinical Psychology or an advanced degree and certification in School Psychology, and had extensive experience assessing children. All the testers were naive to the subject assignment. A doctoral level supervisor with a doctoral degree in school or clinical psychology coordinated the scheduling of the testing, collected the family measures, and ensured the quality of the test results via tester reliability checks and double-checking protocols.

Pretest. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months), all infants were tested with the Battelle Developmental Inventory (BDI). At the same time the parents completed the Parenting Stress Index (PSI), an assessment of the stress perceived by the parents; the Family Support Scale (FSS), a measure of the number of different sources of support available to families with young children; the Family Resource Scale (FRS), a measure of the different kinds of resources available; the Family Inventory of Life Events and Changes (FILE), which assesses the life events and changes experienced by the family during the previous 12 months; and the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the cohesiveness and adaptability of the family. All test and questionnaire protocols were sent to the program coordinator for scoring and placement in a data file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the newborn.

Posttests. Posttesting occurred first at 12 months corrected age and annually thereafter. The posttest battery was administered by the same diagnostician who was "blind" to the subject's group assignment. The child was given the BDI; the parent completed the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the previous year, and a parent demographic survey. In addition, videotapes were made of mother-infant interaction in a semi-structured play session.

The parent-child interaction videotape involved the parent and child in play activities. In the first section, the mother and child were asked to play together for 15 minutes "as they would at home." Then, for one minute, the parent encouraged the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent was asked to leave the room for 45 seconds, and taping continued for two minutes after the parent returned to the room. Parents were paid a $30 incentive for the testing and videotaping.

Tables 6.5 and 6.6 summarize the instruments administered and the number of subjects tested with each instrument at each observation period.

Table 6.5

Number of Subjects Receiving Each Part of SC-IVH Assessment in First Three Years

Measures	Pretest 3 months AA	First Posttest 12 months AA	Second Posttest 24 months AA	Third Posttest 36 months AA
BDI	66	64	58	53
Binet	n/a	n/a	n/a	53
MCDI*	n/a	50	55	50
PSI	48	64	58	53
FSS	48	64	58	53
FRS	48	64	58	53
FILE	48	64	58	53
FACES	48	64	58	53
Video	48	64	58	53

* For the older subjects, 12 months MCDI's were collected in a separate clinic scheduled two to three months earlier (12 mo CA) and were not considered valid for outcomes in this study. At two and three year data points, missing data reflects parents' failure to complete the form as requested.

Table 6.6

Description of Tests Administered for SC-IVH Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Stanford-Binet Intelligence Test Form L-M (Terman & Merrill, 1973)	The Stanford-Binet is a norm-referenced measure of general intellectual ability.
Minnesota Child Development Inventory (Ireton & Thwig, 1974)	The MCDI is a maternal report paper and pencil measure which provides norm-referenced age-equivalent scores in general development, gross and fine motor, expressive language, comprehension-conceptual, situation comprehension, and self-help skills.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
Parent-Infant Interaction Videotape	Semi-structured play session which could subsequently be scored by raters "blind" to experimental group of child.

Results and Discussion

The purpose of this study was to examine the effectiveness of an early, intensive motor intervention compared to a delayed comprehensive developmental intervention for a group of infants at risk for developmental delays because of a history of intraventricular hemorrhage or very low birthweight.

Comparability of Groups on Pretest Measures

Tables 6.7 - 6.9 summarize the analyses of the comparability of groups on the pretest child and family functioning measures. There were no statistically significant differences on any of the pretest measures of infant development or family functioning.

Table 6.7

Comparability of Groups on Pretest Measures for 64 subjects in SC IVH-Year One Analyses

Variable	Delayed Intervention $\bar{x}$	Delayed Intervention (SD)	Delayed Intervention n	Early Intervention $\bar{x}$	Early Intervention (SD)	Early Intervention n	ANCOVA F	p Value	ES♦
• **Age in Months at Posttest**	3.5	(.9)	30	3.4	(1.0)	34			
• **Battelle Developmental Inventory (BDI)**									
Raw Scores for:									
Personal/Social	16.4	(5.5)	30	17.2	(5.3)	34	.41	.52	-.15
Adaptive Behavior	12.1	(5.1)	30	12.2	(5.4)	34	.01	.92	.02
Motor	12.1	(5.1)	30	12.0	(4.3)	34	.01	.94	-.02
Communication	8.5	(3.1)	30	8.3	(3.1)	34	.03	.86	-.06
Cognitive	5.6	(3.6)	30	5.6	(2.5)	34	.00	.95	.00
TOTAL	56.0	(20.2)	30	54.2	(15.4)	34	.17	.68	-.09
• **Parenting Stress Index (PSI)**									
Child Related	109.9	(20.3)	20	113.9	(13.9)	28	.68	.41	-.20
Other Related	119.0	(24.6)	20	126.1	(26.5)	28	.89	.35	-.29
TOTAL	228.9	(40.3)	20	239.9	(36.5)	28	.99	.33	-.27
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**									
Adaptation	23.4	(7.8)	18	23.1	(7.0)	26	.02	.89	-.04
Cohesion	39.3	(5.5)	18	37.5	(6.8)	26	.89	.35	-.33
• **Family Resource Scale (FRS)▲**	119.9	(17.3)	16	125.1	(54.1)	26	.14	.71	.30
• **Family Support Scale (FSS)▲**	11.1	(5.7)	18	11.2	(10.6)	26	.00	.97	-.02
• **Family Index of Life▲ Events and Changes (FILE)**	31.3	(13.8)	18	26.8	(12.3)	26	1.31	.26	-.33

♦ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

▲ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

Table 6.8

Comparability of Groups on Pretest Measures for 58 subjects in SC IVH-Year Two Analyses

Variable	Delayed Intervention $\bar{x}$	Delayed Intervention (SD)	Delayed Intervention n	Early Intervention $\bar{x}$	Early Intervention (SD)	Early Intervention n	ANCOVA F	p Value	ES♣
• **Battelle Developmental Inventory (BDI)**									
Raw Scores for:									
Personal/Social	16.6	(5.4)	27	17.2	(5.2)	31	.19	.67	.11
Adaptive Behavior	11.9	(5.0)	27	11.8	(5.5)	31	.00	.96	-.02
Motor	12.0	(4.1)	27	12.0	(4.4)	31	.00	.98	.00
Communication	8.5	(3.0)	27	8.3	(3.2)	31	.10	.75	-.07
Cognitive	6.0	(3.6)	27	5.7	(2.6)	31	.12	.73	-.08
TOTAL	56.1	(18.7)	27	53.7	(15.3)	31	.29	.59	-.13
• **Parenting Stress Index (PSI)**									
Child Related	108.1	(19.8)	18	114.6	(13.9)	25	1.61	.21	-.33
Other Related	119.3	(25.0)	18	127.3	(23.5)	25	1.13	.29	-.32
TOTAL	227.4	(39.4)	18	241.8	(33.0)	25	1.67	.20	-.37
• **Family Adaptation and+ Cohesion Evaluation Scales (FACES)**									
Adaptation	23.5	(7.8)	16	22.0	(6.5)	23	.39	.54	-.39
Cohesion	39.1	(5.6)	16	36.3	(6.4)	23	1.93	.17	-.50
• **Family Resource Scale (FRS)♠**	119.4	(18.8)	16	122.9	(57.3)	23	.05	.83	.19
• **Family Support Scale (FSS)♠**	10.1	(5.5)	16	11.9	(11.2)	23	.35	.56	-.33
• **Family Index of Life♠ Events and Changes (FILE)**	31.1	(13.4)	16	25.9	(12.2)	23	1.56	.22	-.39

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

Table 6.9

Comparability of Groups on Pretest Measures for 53 subjects in SC IVH-Year Three Analyses

Variable	Delayed Intervention $\bar{x}$	Delayed Intervention (SD)	Delayed Intervention n	Early Intervention $\bar{x}$	Early Intervention (SD)	Early Intervention n	ANCOVA F	p Value	ES♣
• **Battelle Developmental Inventory (BDI)**									
Raw Scores for:									
Personal/Social	16.6	(5.6)	25	17.2	(5.6)	28	.16	.69	.11
Adaptive Behavior	11.8	(5.1)	25	11.4	(5.1)	28	.10	.75	-.08
Motor	12.2	(4.2)	25	11.8	(4.4)	28	.12	.73	-.10
Communication	8.6	(3.1)	25	8.2	(3.3)	28	.15	.70	-.13
Cognitive	6.2	(3.7)	25	5.6	(2.6)	28	.52	.47	-.16
TOTAL	56.6	(19.3)	25	52.8	(15.5)	28	.65	.43	-.20
• **Parenting Stress Index (PSI)**									
Child Related	107.8	(19.8)	16	114.1	(14.3)	22	1.34	.25	-.32
Other Related	120.6	(24.4)	16	130.0	(26.9)	22	1.24	.27	-.39
TOTAL	228.3	(38.3)	16	244.0	(36.3)	22	1.66	.21	-.41
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**+									
Adaptation	23.0	(7.8)	14	24.0	(6.6)	20	.15	.71	.13
Cohesion	39.3	(5.3)	14	37.2	(6.8)	20	.91	.35	-.40
• **Family Resource Scale (FRS)**♠	120.8	(18.7)	12	127.6	(60.4)	20	.14	.71	.36
• **Family Support Scale (FSS)**♠	11.6	(5.0)	14	12.4	(11.5)	20	.06	.80	-.16
• **Family Index of Life**♠ **Events and Changes (FILE)**	31.5	(13.6)	14	27.9	(11.3)	20	.71	.41	-.26

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

Effects of Early Versus Delayed Intervention on Measures of Child and Family Functioning

Selection of covariates. The effects of the early intervention program on child and family functioning were analyzed using one-way analyses of covariance (ANCOVA). ANCOVA procedures were employed for two purposes: (a) to increase the statistical power of the analyses by reducing error variance; and (b) to statistically adjust for any pretreatment differences between the groups. As noted in description of the subjects, there were several potentially clinically significant medical variables (gestational age, days on vent, ROP) and one statistically significant demographic variable (child gender) which were considered as covariates. Although the Delayed and Early Intervention groups appeared different on these variables, none of them were related at all to developmental scores, so they were not employed as covariates. It was still considered important to control for pretreatment differences.

Thus, differences between the Early and Delayed Intervention Groups were analyzed using one-way univariate analyses of covariance, with only pretest scores as covariates. Table 6.10 represents the data for the one year posttest BDI scores for the early and delayed intervention groups. These results indicate significant differences between the groups, with the early intervention group scoring lower than the delayed intervention group on four of the eight domains. Parent report of child development on the MCDI was also compared. As there was no pre-test counterpart for this measure, the comparison was a simple t-test.

As discussed above, only a subsample of the overall group received the complete pretest battery. Forty-five subjects received both a one-year posttest and all of the family measures (PSI, FSS, FRS, FACES III, and the FILE) at the pretest. Thus, the use of pretest measures other than the BDI as covariates would have reduced the number of subjects who had posttest data available for analyses. Thus, the family measures were analyzed without covariates. These results are also represented in Table 6.10. There were no significant differences between the early and delayed intervention groups on the family measures.

Analyses of posttest differences. The results of the analyses of the child and family measures indicated that after one year of intensive motor oriented intervention, the infants in the Early Intervention group had made less progress than control subjects in several developmental domains. It is particularly important that the infants were doing more poorly in the gross motor and overall motor areas as the

Table 6.10

First Posttest Measures of Child & Family functioning for Delayed (no) Intervention Group versus Early Intervention Group for SC-IVH Study

	Delayed (No) Intervention				Early Intervention						
Variable	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n	ANCOVA F	p value	ES♣
• Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal/Social	39.3	(10.3)	39.7	30	34.6	(9.8)	34.1	34	5.81	.02	-.54
Adaptive Behavior	32.2	(7.6)	32.3	30	30.5	(7.4)	30.4	34	1.39	.24	-.25
Gross Motor	29.1	(10.6)	29.0	30	24.6	(9.0)	24.7	34	3.12	.08	-.42
Fine Motor	15.5	(6.0)	15.5	30	14.0	(4.6)	14.0	34	1.50	.23	-.25
Motor	44.5	(15.6)	44.6	30	38.3	(12.5)	38.3	34	3.51	.07	-.40
Communication	22.4	(6.2)	22.4	30	19.4	(5.9)	19.5	34	3.86	.05	-.47
Cognitive	18.1	(5.8)	18.1	30	17.7	(4.9)	17.7	34	.09	.77	-.07
TOTAL RAW	156.5	(42.5)	156.0	30	140.6	(35.9)	141.0	34	2.72	.10	-.35
• Minnesota Child Development Inventory (MCDI)♦											
General Development	92.9	(31.1)		26	83.6	(27.6)		31	1.20	.23	-.30
Gross Motor	90.2	(30.2)		26	79.4	(24.4)		31	1.49	.14	-.36
Fine Motor	88.6	(26.1)		26	84.7	(30.5)		31	.52	.60	-.15
Express.Language	90.6	(27.5)		26	87.9	(20.9)		31	.41	.68	-.10
Conceptual Comprehension	99.2	(45.1)		26	86.4	(25.2)		31	-.22	.82	-.28
Situation Comprehension	91.6	(32.9)		26	81.9	(28.6)		31	1.18	.24	-.29
Self-Help	101.6	(43.0)		26	86.3	(28.2)		31	1.56	.12	-.36
Personal Social	95.4	(33.1)		26	80.1	(23.6)		31	1.95	.06	-.46
• Parenting Stress Index (PSI)											
Child Related	111.5	(22.9)	112.2	20	113.1	(20.5)	112.4	27	.00	.96	-.01
Other Related	122.6	(26.5)	125.2	20	126.8	(35.6)	124.1	27	.02	.88	.04
TOTAL	234.0	(44.6)	237.7	20	240.0	(50.8)	236.3	27	.01	.91	.03
• Family Adaptation and Cohesion Evaluation Scales (FACES)											
Adaptation	20.9	(6.0)	21.0	17	22.2	(7.4)	22.1	25	.30	.59	.18
Cohesion	36.3	(5.7)	35.9	17	36.8	(8.9)	37.2	25	.28	.60	.23
• Family Resource Scale (FRS)♠	120.6	(18.2)	121.2	16	116.6	(25.0)	16.1	25	.56	.46	-.28
• Family Support Scale (FSS)♠	30.7	(16.1)	29.2	17	29.0	(14.1)	30.6	25	.13	.72	.09
• Family Index of Life♠ Events and Changes (FILE)	8.5	(6.5)	8.5	17	9.0	(6.8)	9.0	25	.05	.83	-.08

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♦ Scores were calculated by computing a ratio of developmental score in months/chronological age in months. There were no covariates, and scores here were compared using t-tests rather than ANCOVA F. (thus, no Adjusted X)

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

intervention during the first year was specifically targeted to motor development. Parent report on the MCDI was consistent with the Battelle in showing few statistically significant differences but marked trends in the direction of delayed (no) intervention subjects being described as more advanced (on average "normal" for chronological age) compared to those in early intervention with Physical Therapist (PT) in year one. Analysis of family measures showed virtually no difference between the Delayed (no) Intervention and Early Intervention subjects.

The same analysis procedure was followed for the second posttest which was given at 2 years of age. Fifty-eight infants received this posttest. The results of the analyses of the child and family measures are presented in Table 6.11.

At the second posttest, there were no significant differences between the two groups on the Battelle Developmental Inventory, on the MCDI, or on any of the family measures. Although poor norms on the Battelle scale make clinical interpretation of the results difficult, the MCDI scores at this stage, as at post-test one, suggested a remarkable trend. That is, parents in Delayed Intervention groups were more likely to perceive and report their youngsters at age appropriate levels compared to early intervention participants parents. These data raise the issue of whether one effect of early intervention was to heighten parent's awareness of their youngsters limitations or, conversely, that Delayed Intervention may have allowed parents to postpone or avoid noticing areas in need of work. Although there were no statistically significant differences between the groups, it was noteworthy that the delayed intervention group had lower scores on the Parenting Stress Index for non-child-related stress (ES= -.45, higher cohesion on the FACES (ES= -.57), and more resources on the FRS (ES= -.58). The third post-test revealed a similar pattern of no significant differences between groups on either developmental or family measures. The few non-significant differences in means that were noted in year two were even smaller, and

Table 6.11

Second Posttest Measures of Child and Family functioning for Delayed vs. Early Intervention Groups for SC-IVH Study

	Delayed Intervention				Early Intervention						
VARIABLE	X̄	(SD)	Adj. X	n	X̄	(SD)	Adj. X	n	ANCOVA F	p Value	ES♣
• Age in Months at Posttest											
• Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal/Social	67.3	(16.4)	67.6	27	63.5	(17.1)	63.2	31	1.05	.31	-.27
Adaptive Behavior	51.5	(12.7)	51.4	27	47.9	(11.4)	47.9	31	1.35	.25	-.28
Gross Motor	45.6	(11.7)	45.5	27	40.7	(15.3	40.1	31	1.64	.21	-.42
Fine Motor	25.2	(7.4)	25.1	27	24.6	(7.4)	24.6	31	.07	.78	-.08
Motor	70.8	(18.0)	70.8	27	65.3	(21.3)	65.3	31	1.13	.29	-.31
Communication	34.4	(8.0)	34.3	27	31.3	(9.1)	31.4	31	1.69	.20	-.36
Cognitive	25.6	(7.2)	25.5	27	22.9	(6.0)	22.9	31	2.20	.14	-.36
TOTAL RAW	247.4	(57.6)	246.0	27	230.8	(57.6)	232.1	31	.89	.35	-.24
• Minnesota Child Development Inventory (MCDI) ♦											
General Development	93.8	(26.8)		25	86.4	(28.2)		30	.99	.33	-.27
Gross Motor	103.0	(42.1)		25	86.7	(37.2)		30	1.52	.13	-.39
Fine Motor	103.2	(34.9)		25	94.5	(26.2)		30	1.05	.30	-.25
Express. Language	95.0	(26.0)		25	90.1	(24.5)		30	.72	.47	-.19
Conceptual Comprehension	95.1	(26.6)		25	93.4	(31.8)		30	.21	.83	-.06
Situation Comprehension	100.4	(40.9)		25	89.8	(24.7)		30	1.31	.26	-.26
Self-Help	103.0	(42.6)		25	94.4	(32.0)		30	.85	.40	-.20
Personal Social	93.7	(33.1)		25	87.7	(25.4)		30	.76	.44	-.18
• Parenting Stress Index (PSI)											
Child Related	109.6	(20.2)	112.2	18	108.3	(28.7)	105.7	25	.88	.35	.32
Other Related	116.8	(22.4)	118.9	18	131.1	(26.8)	129.0	25	2.20	.15	-.45
TOTAL	226.4	(39.3)	230.9	18	243.4	(41.2)	238.9	25	.55	.46	-.20
• Family Adaptation and Cohesion Evaluation Scales (FACES)											
Adaptation	21.8	(6.3)	21.5	16	19.5	(4.6)	19.7	23	1.26	.27	-.29
Cohesion	39.5	(5.1)	38.7	16	35.1	(7.9)	35.8	23	2.03	.16	-.57
• Family Resource Scale (FRS)♠	121.1	(19.0)	121.4	13	110.5	(21.4)	110.3	22	2.87	.10	-.58
• Family Support Scale (FSS)♠	31.2	(15.3)	29.5	16	25.6	(11.7)	27.3	23	.40	.53	-.14
• Family Index of Life♠ Events and Changes (FILE)	7.0	(4.8)	7.1	16	9.7	(10.2)	9.6	22	.79	.38	-.52

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♦ Scores were calculated by computing a ratio of developmental score in months/chronological age in months. There were no covariates, and scores here were compared using t-tests rather than ANCOVA F.(thus, no Adjusted X)

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

the groups essentially looked comparable on most dimensions. These results are summarized in Table 6.12.

The results of this three year longitudinal study suggest that with this population of medically fragile infant (IVH and/or <1000 grams), early motor intervention of the type and intensity utilized here provided neither short term nor longer term measurable benefits. If anything, the groups who did not participate in intervention in year one looked significantly better than their randomly assigned counterparts on key developmental dimensions.

The results of this study concur with those of two recently released studies (Goodman et al., 1985; Palmer et al., 1988). While there are important methodological differences between this study and those performed previously, the pattern of results begins to suggest that early intervention which is directed mainly or exclusively toward facilitation of motor development in the first year of life may not be effective for this population. It remains to be seen whether interventions that are more broadly based and are more intensive would be effective in preventing or remediating developmental problems. The study described below addressed this issue.

The largest set of studies other than the one reported in this volume that has examined intervention outcomes to this extent is the Infant Health and Development Program (Infant Health and Development Program, 1990). Although a direct comparison is difficult because many of the participants in this study would have been excluded from or examined separately in IHDP, the findings of the projects provide some perspective on the present finding. In the Infant Health and Development Program, significant group differences were not reported at year one or year two between control groups and groups receiving much more expensive comprehensive full day, five day programming. At year three, significant differences existed in group means, with the exception of the "lighter" infants (< 1500 g). These lighter and more delayed infants did not benefit significantly from the intervention program which was very intensive. Perhaps even more heroic interventions are needed for this population.

Table 6.12

Third Posttest Measures of Child & Family functioning for Delayed vs Early Intervention groups for SC-IVH Study

	Delayed Intervention				Early Intervention						
VARIABLE	$\bar{X}$	(SD)	Adj. X	n	$\bar{X}$	(SD)	Adj. X	n	ANCOVA F	p Value	ES♠
• Age in Months at Posttest											
• Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal/Social	92.2	(27.0)	92.7	25	88.5	(30.6)	88.0	28	.36	.55	-.17
Adaptive Behavior	68.5	(17.9)	68.3	25	62.4	(18.2)	62.6	28	1.36	.25	-.32
Gross Motor	53.6	(15.8)	53.3	25	47.7	(17.1)	47.9	28	1.33	.25	-.37
Fine Motor	34.2	(10.4)	34.3	25	30.3	(10.2)	30.2	28	2.09	.15	-.38
Motor	87.7	(25.8)	87.4	25	78.0	(26.1)	78.3	28	1.62	.21	-.35
Communication	43.4	(12.4)	43.4	25	89.8	(13.7)	39.9	28	.99	.32	-.20
Cognitive	33.7	(11.7)	33.6	25	31.5	(10.7)	31.6	28	.41	.53	-.17
TOTAL RAW	325.1	(86.0)	322.7	25	300.3	(89.5)	302.7	28	.20	.41	-.23
• Stanford Binet ♦	88.6	(12.4)		20	85.2	(11.8)		20	.87	.39	-.27
• Minnesota Child Development Inventory (MCDI) ♦											
General Development	88.0	(36.5)		23	78.5	(32.6)		27	.97	.33	-.26
Gross Motor	97.3	(51.9)		23	79.6	(47.4)		27	1.52	.13	-.34
Fine Motor	87.8	(41.6)		23	77.6	(35.5)		27	.94	.35	-.25
Express. Language	80.9	(27.5)		23	82.9	(37.0)		27	-.22	.82	.07
Conceptual Comprehension	92.0	(39.2)		23	84.6	(39.1)		27	.69	.50	-.19
Situation Comprehension	97.2	(46.2)		23	88.2	(44.0)		27	.70	.48	-.19
Self-Help	105.7	(50.7)		23	90.6	(40.5)		27	1.16	.25	-.28
Personal Social	87.5	(39.7)		23	75.2	(29.8)		27	1.25	.21	-.30
• Parenting Stress Index (PSI)											
Child Related	116.2	(25.3)	117.4	15	115.2	(26.3)	114.0	22	.16	.69	.13
Other Related	123.5	(23.3)	126.0	15	126.8	(28.6)	124.3	22	.07	.79	.07
TOTAL	239.7	(44.3)	244.3	15	242.0	(47.0)	237.4	22	.29	.59	.16
• Family Adaptation and Cohesion Evaluation Scales (FACES)											
Adaptation	22.4	(8.8)	22.5	12	20.6	(6.3)	20.5	19	.72	.40	-.23
Cohesion	37.0	(4.6)	36.6	12	34.6	(8.6)	35.0	19	.39	.54	-.35
• Family Resource Scale (FRS) ♠	107.8	(17.1)	106.7	11	111.8	(24.2)	113.0	19	.75	.40	.37
• Family Support Scale (FSS) ♠	33.6	(18.9)	32.5	13	24.9	(9.6)	26.0	19	3.30	.08	-.34
• Family Index of Life ♠ Events and Changes (FILE)	5.8	(2.7)	5.8	13	6.7	(4.6)	6.7	20	.39	.54	-.33

♠ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♦ Scores were calculated by computing a ratio of developmental score in months/chronological age in months. There were no covariates, and scores here were compared using t-tests rather than ANCOVA F (thus, no Adjusted $\bar{x}$).

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

Preliminary Treatment Compliance Analyses

As explained above, parent interviews were completed in 1990-91 as part of an additional treatment verification process. Although Much of this data still needs to be quantified, initial review of interview data and interventionist records were utilized to allow for preliminary examination of treatment compliance as a factor in these results.

The project director and research coordinator independently assigned subjects to one of four treatment categories based on their participation: (1) subjects assigned to early intervention who completed both Year 1 and 2 with good compliance (Early/Comply); (2) subjects assigned to early intervention who withdrew or failed to comply with both parts (Early/Non-comply); (3) subjects assigned to Delayed who participated fully once they were invited to be in intervention in Year 2 (Delayed/Comply); and (4) subjects assigned to Delayed who dropped out prematurely or failed to participate meaningfully (Delayed/Non-comply). The independent raters agreed on 61 of 64 category assignments, then agreed together on the assignment of the three whose status was first ambiguous.

A 2 x 2 ANOVA was utilized to compare the four groups' developmental and family outcomes at two and three year posttests (Year 1 was omitted since "Delayed" subjects had not yet had an opportunity to become compliers vs. non-compliers at this assessment). There were no significant differences between groups or between compliers and noncompliers, and there were no significant interactions on any of the variables. Thus, there were no measurable differences among assignment or compliance groups.

A second set of analyses selected only the "early intervention" subjects in the "comply" group, and compared them to the "delayed" intervention subjects regardless of compliance status. For this analysis, seven subjects were removed, regardless of group based on their profound disabilities and sensory impairments making their potential for intervention responsiveness different from that of the rest of the sample. When this "clean" group of consistently participating early intervention subjects was compared to delayed subjects, there were again no significant differences on developmental or family measures. The means of the early intervention subjects, however, were consistently lower than those of delayed intervention subjects on developmental measures.

These results suggest that the early delivery of this type and intensity of treatment to this population did not provide a measurable advantage over delayed intervention. Furthermore, subjects who self-selected to become non-participants for whatever reasons (at least some of these subjects felt they did not need intervention because problems were not evident) did not progress differently than subjects in either delayed or early intervention.

Conclusions

It is clear from the analyses of the demographic data of the overall group that random assignment worked well and created groups which were comparable with respect to relevant characteristics of children and families. The groups were balanced on all demographic and medical characteristics except the proportion of males in the groups. This imbalance did not, however, affect the outcomes. In addition, the groups did not differ on any of the pretest child or family measures. The results of the analysis of pretest child and family measures also indicate that random assignment provided balanced groups for this study. There were no significant differences between the early and delayed intervention groups at pretest.

The results of the first year posttest indicate that after one year of intensive motor oriented intervention, the early intervention group demonstrated poorer developmental progress. The early intervention group preformed more poorly on the BDI; family measures did not indicate any effects of the intervention. The results of the analyses of the second and third post-test indicated no significant differences between the groups. This finding is consistent with recent studies of motor intervention with other populations, and complimented by studies of much more ambitious intervention. Additional studies in the coming year will focus on explanation and clarification of these findings.

COLUMBUS MEDICALLY FRAGILE PROJECT

Project #7

COMPARISON: Infants with Bronchopulmonary Dysplasia (BPD) or neurologic damage --Coordinated comprehensive services beginning one month prior to hospital discharge vs. services begun at 3 years of age.

LOCAL CONTACT PERSONS: Daniel Coury, Columbus Children's Hospital

EIRI COORDINATOR: Linda Goetze

LOCATION: Columbus, Ohio

DATE OF REPORT: 11-12-1991

Rationale for the Study

Although significant advances in perinatal and neonatal care over the last decade have improved the outlook for the extremely premature infant, this group of infants still accounts for 50% of the neonatal mortality rate, and the surviving very low birthweight infants contribute significantly to the population of children with multiple disabilities (McCormick, 1985; Raju, 1986). Conditions frequently associated with survivors of premature birth include Bronchopulmonary Dysplasia (BPD) and abnormal neurologic findings.

The presence of chronic pulmonary disease (bronchopulmonary dysplasia--BPD) at the time of discharge from the nursery is one of the strongest predictors for multiple disabilities (Escobedo & Gonzales, 1986; Koops, Abman, & Accurso, 1984; O'Brodovich & Mellins, 1985). BPD is a unique disorder of the newborn infant who requires mechanical ventilation and oxygen therapy at birth (O'Brodovich & Mellins, 1985). BPD has become increasingly frequent as smaller and smaller infants survive, and affects up to 40% of surviving infants weighing less than 1500 g at birth (Escobedo & Gonzalez, 1986). Although BPD is a severe disabling disorder, it differs from other forms of chronic lung disease in that many affected infants demonstrate substantial improvement and recovery of lung function over the first few years of life. However, despite the encouraging improvement in pulmonary status, up to 40% of these infants have other major disabilities (Koops et al., 1984). The most frequent disabilities include growth failure, developmental delays, neurologic insults, visual problems, and deafness (Koops et al., 1984).

The etiology of the developmental delays observed in infants with BPD is usually multifactorial and may be related to inadequate nutrition during a critical period of brain growth and differentiation. In addition to demonstrating developmental delays, these infants have substantial health problems beyond the neonatal period, and up to 30% are re-hospitalized during infancy (Hack, Caron, Rivers, & Fanaroff, 1983; McCormick, Shapiro, & Starfield, 1980).

A second predictor for neurodevelopmental delay in premature low birthweight children is the presence of abnormal neurological findings, including intraventricular hemorrhage (IVH), perinatal asphyxia, and congenital neurologic anomalies. Recent advances have been made in the early identification of brain insults which predict later neurologic impairment in this group of infants. It is now routine to monitor preterm infants for intracranial bleeding with the non-invasive cranial ultrasound. It is possible to identify infants in the first few months of life who are at extremely high risk for later neurodevelopmental delays on the basis of structural brain damage.

Perinatal care and medical advances have dramatically improved the short-term outlook for infants with BPD and neurological damage. However, most of the gain in expertise and knowledge is based in the tertiary care hospital and is not available to the infant, family, or local health, social service, and early intervention personnel following hospital discharge. Consequently, many local primary care physicians and public health nurses are uncomfortable supervising and directing the care of these complex children, and those families that live two to three hours from the tertiary care hospital have difficulty accessing adequate local medical care.

Many public programs require proof of a measured developmental delay before they will provide services to the child or the family. Unfortunately, measuring such delays in infants can be very difficult. Infants with disabilities may also not receive services because professionals may not be aware of what services will aid children and families most effectively. This may be true for service referrals which promote earlier infant hospital discharge (Brooten et al., 1985), or for those which would affect the development of infants like those in this study (Barrera, Cunningham, & Rosenbaum, 1986).

The resulting fragmentation of health care with multiple visits to multiple specialists at often geographically distant tertiary care centers is cited by parents as a major problem in caring for their chronically ill children (Parren & Ireys, 1984). Added to the problem of inadequate local health care resources, families may find that local early intervention personnel are not trained in the specialized medical, educational, and social needs of medically fragile infants and their families, and that home-based intervention delivery may not be available as a service option. In fact, there is evidence that local professionals, who seldom work with medically fragile infants, lack clinical experience to address problems like BPD (Bricker & Slentz, 1988; Bruder & McLean, 1988). In sum, a critical need exists to assess the efficacy of projects which begin intervention for such children in the NICU and provide transitions to community-based intervention programs.

Some evidence suggests that regionalization of care to the home and community can be an effective means of improving the functional status of the medically fragile infant. Several studies have successfully used home-based intervention programs to facilitate developmental progress in low birthweight infants (Infant Health and Development Program, 1990; Ramey & Campbell, 1987; Resnick et al., 1987). This project is unique in that all the infants who receive intervention services have serious medical considerations.

Philosophical and Theoretical Rationale for the Services

The type of early intervention program used in the Columbus Medically Fragile Project (Columbus/MF) flows from the theoretical position set forth by Urie Bronfennbrenner (1979) in The Ecology of Human Development. Bronfennbrenner views the environment as a set of nested structures, each inside the next. The basic unit is the setting, such as the family, which includes the developing person. The relationships between settings form the next level of influence upon development. Bronfennbrenner argues that the relationships between settings can play as decisive a role in development as the events within a given setting. Consequently, this project endeavors to facilitate the family's ability to meet the infant's needs and impact on the transition between the hospital and the community, since both can greatly influence the infant's development. Bronfennbrenner also contends that the practices of society at large can profoundly influence the developing person. The importance of this level of influence is exemplified by P.L. 99-457, the public law which encourages states to provide appropriate early intervention services to all infants and toddlers with disabilities.

As the Bronfennbrenner model suggests, the families of medically fragile infants vary along several major dimensions: the functioning of the family, which includes and is affected by the status of the infant; the influence of the hospital; the effects of the practices of society at large; and the community resources available to the family. Following this model, the Columbus project attempted to enhance the family's functioning, the status of the infant, and the community's ability to meet the family's and infant's needs. The project also attempts to influence societal attitudes and practices as regards the care and development of the medically fragile infant and his/her family. Figure 7.1 illustrates the model used to design services for children and families participating in this project.

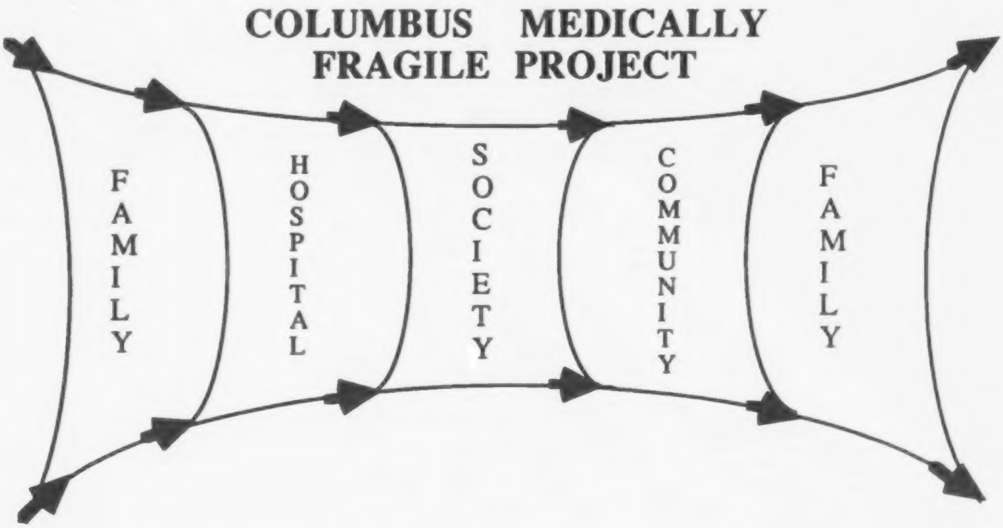

Figure 7.1: Path of the Columbus/MF Project Model facilitating optimal family and infant functioning from the hospital to the community and home.

The project was also influenced by the theoretical models of adult education (Falvo, 1985; Knowles, 1980, 1984) and social support (House & Kahn, 1985; Madge & Marmot, 1987; Thorts, 1982; Veiel, 1985), with the goal of providing services to aid the transition of families and infants to local professionals.

The Columbus/MF program serves as a model for specialized care and support to the home and community following hospital discharge of the infant, rather than basing this support in the tertiary care hospital. As previously indicated, the medically fragile infant is at established risk for developmental delays due to serious long-term medical and nutrition problems, lack of coordinated follow-up and intervention services in the local area, and lack of specialized training for local health, social service, and educational intervention personnel. There is a need to determine whether the developmental outcome of medically fragile infants and the functioning of their families can be improved through coordinated and comprehensive services to ease their transition from the hospital to their local community.

Overview of Study

Two intensities of service to medically fragile infants and their families are investigated. The effects of a coordinated and comprehensive system of early intervention services initiated prior to discharge from the NICU are compared with the effects of services routinely provided by the hospital through medical check-ups and referrals following discharge. Infants in both the high and low-intensity intervention received NICU follow-up and referral. This follow-up included regular assessment, pediatrician check-ups and evaluations in the NICU clinic based in Columbus Children's Hospital. Referrals were made for all infants and their families to health and other service providers in their local communities. These services are provided to all NICU graduates of the hospital. In addition, the high-intensity group of infants received comprehensive, coordinated services from a transition team to facilitate their transition from a centralized source (the Columbus Children's Hospital, CCH), to regionalized sources (agencies within local communities). The randomly assigned comparison group of children, the low-intensity group, received only the limited services previously available to CCH NICU graduates as described above and by Koops et al. (1984).

Methods

The Columbus/MF Project was a cooperative research effort with "A Collaborative Approach to the Transition from the Hospital to the Community and Home Project," an HCEEP Demonstration Project of the Columbus Children's Hospital (CCH) in Columbus, Ohio. The project served graduates of CCH's newborn intensive care unit (NICU) and their families who lived in Ohio's Perinatal Region IV. This region encompassed 33 counties in the mid- and southeastern sections of the state. The area was primarily rural, although it included the urban center of Columbus.

The Columbus/MF HCEEP demonstration project was funded by the U.S. Department of Education from 1987-90. Year 1 was devoted to model development and focused on three objectives. The first objective was to establish collaborative intervention teams to service medically fragile infants and their families in the catchment area. To meet this objective, local administrators of health, social service, and education/early intervention agencies entered into collaborative agreements with the HCEEP project, and local intervention personnel were identified to provide services.

The second objective was to construct an intervention and service delivery model using the following multiple assessment factors: current status of infants and their caregivers, stresses on the family and extra-familial systems, and the availability and use of family and extra-familial supports. Assessment and intervention protocols were developed and compiled to assess health and nutritional status, developmental status, parent-child interaction, home environmental factors, family stresses, and needed supports. The measures assessing infant and family characteristics are described in further detail in the data collection section of this report.

The final objective during the first year was the training of local collaborative intervention teams in the family-focused, home-based intervention model. In addition to orienting the collaborative intervention teams to the model, a series of multidisciplinary workshops, focusing on the medical, educational, and psychosocial needs of these infants and their families was held for all team members to promote collaborative case management, continuity, and transition of services.

During the project's second and third funding years, the efforts concentrated on subject enrollment, coordination of services and service provision, and data collection.

Subjects

The Columbus project enrolled 52 subjects between October 1, 1988, and March 12, 1990. A description of the recruitment and assignment procedures and the characteristics of study participants follows.

Recruitment. Medically fragile infants who were hospitalized in the Columbus Children's Hospital Intensive Care Unit were eligible to participate in the study if they were diagnosed with moderate to severe BPD and had a need for oxygen therapy and/or two or more pulmonary medications upon hospital discharge. Infants with neurologic conditions, e.g., severe (Grade IV) perinatal intraventricular hemorrhage, hydrocephalus, microcephaly, requiring specialized equipment, e.g., feeding pumps, suction, and/or aerosol equipment, were also eligible.

Eligible infants were identified for inclusion in the study when their weight reached 1500 g (approximately one month before discharge). At that time, the parents were contacted by the project's clinical nurse specialist. The nurse explained to the parents the nature of the study, requested their participation, and if parents were willing, obtained informed consent. If parents decided not to participate in the study, their infant received routine medical and developmental follow-up through the Neonatal Follow-up Clinic, and, if necessary, was referred to local agencies for limited health, occupational therapy, physical therapy, and early intervention services. Parents were informed of their child's group assignment after they completed the informed consent procedure.

Assignment to groups. Infants were enrolled in the study continuously between October 1, 1988, and March 12, 1990. Following enrollment, the infants were randomly assigned to either the high- or low-intensity groups after being stratified by their primary diagnosis of BPD or neurologic damage. The BPD and neurologic groups were each further stratified into groups of more or less severe illness based on the medical severity index developed by the hospital staff. The severity index allowed a physician to rate the infants on a scale of 0-5, with 5 being the most severe or abnormal rating on nine variables thought to be related to medical outcome. The variables included the infant's degree of technology dependence, oxygen dependence, respiratory status, age at discharge, neurologic status, ultrasound/CT findings, head circumference, feeding status, and sensory impairment. A total severity score ranging from 3 to 45 points was obtained. Infants receiving a score of 18 and below were determined to be "low risk," and those receiving a score of 19 and above were considered "high risk." Following both stratification processes, group assignments were randomly made by the EIRI site coordinator, who was unknown to the infants and their families.

Subject Attrition. There were 52 subjects initially enrolled in the study. Table 7.1 presents data on attrition for 6, 12, and 18-month posttests. The reasons for attrition and total sample analyzed for this report at each posttest are presented. At 6 months posttest, 6 infants were hospitalized so that assessments could not take place for these infants.

An analysis of pretest demographic data and measures of child and family functioning indicated no statistically significant differences between the subjects who remained in the study and those lost to attrition on any of the measures. Families of subjects lost to attrition had lower total household income, however, this difference was not statistically significant.

To minimize attrition, both the onsite coordinator and the EIRI coordinator maintained updated telephone numbers and addresses of the participants. Data were collected every six months until the infant reached 24 months age corrected for

Table 7.1

Subject Attrition at Infant Chronological Age at 6, 12, and 18 Months

	Low Intensity	High Intensity
Enrollment at 6 month posttest	26	26
Infant deaths	1	2
Hospitalized at 6 months	4	2
Left Project	1	1
TOTAL TESTED	20	21
Enrollment at 12-month posttest	26	26
Infant deaths	1	3
Left Project	2	2
TOTAL TESTED	23	21
Enrollment at 18-month posttest	26	26
Infant deaths	1	3
Left Project	4	2
TOTAL TESTED	21	21

prematurity (CCA)[1]. Infants and families in the high-intensity group were in frequent personal and telephone contact with study personnel as intervention services were delivered. By definition, infants in the low-intensity group did not meet with study personnel between assessments; however, the study was successful in assessing infants in both groups on time. If needed, study personnel arranged for transportation services to assist families in meeting scheduled assessment appointments.

Demographic characteristics. Information was gathered by questionnaires regarding family income, ethnic background, parent occupation, number of siblings, and primary caretaking responsibilities of the participating families. Results of the parent surveys indicated that 36% of the infants were from families living in Columbus, Ohio, and its immediately surrounding area. The remaining 64% resided in towns and rural areas of central and southeastern Ohio. The total sample was composed of 81% Caucasian infants and 19% non-Caucasian infants. Seventy-seven percent of the infants were from two-parent families, and 98% were from homes where English was the primary language spoken. Further information about the demographic characteristics of the infants and families in each group will be presented in the Results and Discussion section.

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[1] *In other words, a child who is born 4 weeks prematurely would not reach a corrected age of 12 weeks until 16 weeks after birth.*

Intervention Programs

The Columbus/MF Project compared a high-intensity intervention program to a low-intensity intervention program. Children in both groups received medical follow-up after their initial discharge from the NICU. The high-intensity intervention group also received coordinated and comprehensive services designed to improve their health and developmental outcomes, and to facilitate their transition from the tertiary hospital to community-based early intervention programs.

High-intensity intervention program. Intervention services provided to the high-intensity intervention group consisted of pre-discharge hospital visits, medical follow-up clinic services, and coordinated multidisciplinary office and home-based early intervention services. The intervention began with two to three weekly hospital-based visits with families approximately one month prior to the infant's discharge from the NICU. The hospital-based visits, which were initiated by the project's clinical nurse specialist and/or social worker, provided an opportunity for families to establish a support system with ties to both the hospital and their home communities, and to allow the project to assist families in planning for their infant's home care needs prior to discharge. These services were designed to help families identify and initiate contacts with service providers in their local areas. The transition team which provided the high intensity services included a clinical nurse specialist, with a background in developmental disabilities and parent/child interaction, and the director, with an interdisciplinary background in early intervention. They provided services on a full-time basis. The team also included a neonatologist, an interdisciplinary developmental consultant with a background in occupational therapy and special education, and a social worker, all of whom worked on the team part-time.

The transition team had several roles. First, they worked with NICU and families in planning discharge from the hospital and in follow-up with local health and developmental services. Second, they assisted families and local service providers in developing and carrying out the Individualized Family Service Plan (IFSP). They also made regular home visits with the family and infant after discharge from the hospital.

Because medical concerns took a primary role in the first weeks after discharge, local services often initially included 24-hour home nursing care, rental or purchase of durable medical equipment such as supplemental oxygen, ventilators, or positioning and feeding equipment. As the infants' medical conditions stabilized in the home settings, additional services included public health, social service, mental health, education, or occupational, physical, and speech therapy.

After hospital discharge, infants received regular medical supervision and developmental evaluation through Columbus Children's Hospital High-Risk Neonatal Follow-up Clinic. The first medical follow-up visit occurred two weeks post-discharge. Additional visits were scheduled for 6, 12, 18, and 24 months of age (all ages referenced in this report prior to 36 months are corrected for prematurity), and yearly thereafter. The clinic was staffed by a neonatologist, a social worker, a nurse coordinator, and an occupational therapist who provided health monitoring and developmental evaluation. Full ancillary services (radiology, drug level monitoring, pharmacy, respiratory therapy, ophthalmology, and audiology) were available in the hospital.

Regular home visits were initiated following hospital discharge and continued for about 12 months. The Columbus/MF project's clinical nurse specialist and developmental consultant attended the home visits with local service providers on at least a monthly basis. Whether or not these collaborative home visits were interdisciplinary depended on the concerns surrounding the infant and the family needs. Participants in these collaborative home visits included at least one member of the Columbus/MF project staff, one local service provider, the family (or at least the primary caregiver), and the infant. Post NICU discharge transition team services focused on IFSP (Individualized Family Service Plan) development and implementation and developing home visit collaboration.

Within 45 days from discharge, the developmental consultant and nurse from the transition team arranged an IFSP meeting with the family and identified local service providers to implement goals of the IFSP. A service coordinator was designated as were providers and methods of service delivery. Nursing services were provided using a community health or home health model where a nurse provides intermittent health assessments and family education with the goal of maintaining and improving the infant's health. Nursing services were provided in a home-based setting, usually for four to twenty-four hours a day. The child's IFSP generally included planning for twelve month outcomes in child health, child development and family functioning.

If the child left the hospital with home oxygen therapy or had experienced a Grade III or IV intracranial hemorrhage the transition team recommended multidisciplinary developmental intervention for the family. This component of the program was influenced by a study of the efficacy of such programs for these infants (Sparling, 1989). This component was broad based in that intervention focused on a range of developmental areas, not just those in which the child showed a deficit. A certified professional in early intervention provided parent training which assisted parents in methods to improve infant's motors skills. This intervention also trained parents in methods of integrating the cognitive, social, communication and adaptive development of their children into play and daily living activities.

Other transition team services varied by community and family. Local community providers and families, assisted by a member of the transition team, developed other services for infants. Single discipline therapy was one alternative, with a therapist focusing on motor or communication skills by completing exercises with the infant and teaching parents to do these therapies as well.

Regular home visits were scheduled by the transition team nurse and developmental consultant in order to gradually shift responsibility for service to local providers and parents. The basic structure of these visits was to update, plan, practice and integrate service into the family routine. Update incorporated discussions with families of assessment results and implications, intervention routines as integrated into family activities, review of program, records, etc.

Planning involved reviewing parent education needs and providing demonstrations, reading materials, videotapes or other materials to assist families with the intervention being implemented to meet identified needs. Health related issues were also reviewed and goals and routines established for maintaining or improving child growth and nutrition. Developmental planning was modeled on the Hawaii Early Learning Profile (HELP) (Furono et al., 1985). This model charts goals incorporating six developmental areas: gross motor, fine motor, social, language, cognitive and self help. It provides charts of developmental milestones which are integrated into an activity-based developmental approach to achieving family and child goals.

During practice the intervention team practices the activities with the child. The team can then discuss and decide the appropriateness of the routine for achieving the designated goal. A calendar was left with families outlining activities, directions, and family strategies for achieving the goals for that month. Families were asked to practice three different activities a day and spend a minimum of one to five minutes on each activity. In order to integrate into the family's routine the family was asked to complete a calendar tracking how often, how many minutes, and when and where the activity was practiced.

Local service providers were also encouraged to assist families in locating and using additional community services such as respite care. The project gradually shifted responsibility from the resource team to the communities. The timing of this shift was individualized to meet the family's needs and the ability of the local service providers to take a more direct and independent role in working with this special population. The ultimate goal of the project was to transfer full responsibility for the care of the medically fragile infant to local service providers (physicians, public health nurses, early educators, etc.). It was anticipated that these agencies would continue to provide necessary services after the children no longer received transition services from this project.

Low-intensity intervention program. Infants in the low-intensity intervention group received the services that were available to all graduates of the NICU. These services included the same medical and developmental follow-up services of the High-Risk Neonatal Follow-up Clinic that infants in the high-intensity intervention group received. However, subjects in the low-intensity intervention group did not receive the coordinated transition services or the office and home-based early intervention services available to the high-intensity intervention group. Infants in the low-intensity intervention group who were found to be delayed, at-risk for delay, or in need of community services by the follow-up clinic, were referred to community agencies by the hospital follow-up clinic. These agencies were notified of the referral. These referral agencies were utilized inconsistently at best. Documentation of how often infants in the delayed group accessed referral services is discussed in the treatment verification section that follows.

Treatment Verification

Treatment verification procedures were carried out to ensure that treatment occurred in accordance with the proposed intervention program plan. It consisted of data collected on the child, family, and intervention program. Treatment verification data on children in the high-intensity intervention group included data on the development of the Individualized Family Service Plan (IFSP), a log of individual services provided by the transition team staff who provided home and office services, and additional services data for Physical/Occupational Therapy (PT/OT), early intervention, and public health nursing services. Additional services data and information on IFSPs was also obtained for infants and families in the low intensity intervention. Data on length and number of transition team visits were kept by the transition team nurse and multidisciplinary development specialists who provided these services.

The transition team nurse and developmental consultant worked toward arranging IFSP meetings for the families in the more intensive group. They contacted local service providers and worked to bring them into the IFSP process. The results of a survey of families who participated in the study at the 18-month posttest, regarding the presence or absence of IFSPs, shows that 12 (60%) of the high intensity group families reported that they had an IFSP in place, while 4 (19%) of the families in the low intensity intervention reported having an IFSP.

Table 7.2 shows the mean number of transition team service hours that the high-intensity group received which were not provided to the low intensity group. These services began at the time the child was enrolled in the intervention. Services peaked by 6 months and were gradually phased out with most services provided by 12 months CCA. In addition, the table shows the total number of service hours that children in the transitional model received either through home- or center-based service.

Table 7.2

Average Number of Transition Team Service Hours Per Infant from Enrollment to 18 Months CCA[*]

	High Intensity			
	$\bar{x}$	(SD)	n	Total
Hours of transition team nursing at office	1.6	(1.5)	21	34
Hours of transition team nursing at home	10.0	(3.1)	21	210
Hours of transition team interdisciplinary child development services at office	3.2	(3.7)	21	67
Hours of transition team interdisciplinary child development services at home	10.0	(5.6)	21	209

[*] *$\bar{x}$ for the Low intensity infants is zero for all transition services.*

[*] *CCA refers to the child's age adjusted for prematurity*

The interdisciplinary child development services, combining home- and center-based figures, averaged about 13.2 hours per child during the transition period. The interdisciplinary services included parent training through demonstration with the infant. The transition team interdisciplinary consultant also provided services to the family to improve the child's motor skills and to help the family integrate the family's daily living situations into the infant's cognitive, communication, adaptive, and social development. The interdisciplinary services were provided by a professional certified in early intervention who also had a background in occupational therapy. Nursing services averaged nearly 12 hours per child, with most of those services provided in the home. Nursing services began prior to discharge from the hospital and focused on developing a plan to assist the family in the transition to their community. The emphasis was on developing local health care, such as pediatrician and public health nursing services and obtaining necessary medical equipment. Children in the high intensity intervention received, on average, 26.5 hours of home and office nursing service during the first 12 months after being released from the hospital.

The transition team home visit services were scheduled as frequently as once per month during the first six months. They gradually decreased during the second six months of intervention; the transition to local services was completed around the 12-month posttest.

Information about additional services received by the child was collected from parents of children in both groups. Data on additional services per child from the time of enrollment to the time of the 12-month posttest are presented in Table 7.3. These service hours are in addition to those provided to high intensity infants that were outlined earlier in Table 7.2. The children in the more intensive intervention received more public health and early intervention services than the children who were assigned to the less intensive group. This is an important confirmation of treatment differences. The more intensive intervention was designed to transition medically fragile NICU infants into services in their local communities. While the differences for physical/occupational therapy (PT/OT) and public health nursing are small, the difference in early intervention services between the groups is quite large and statistically significant with a p-value = .02. As shown by the percentage

Table 7.3

Additional Services Hours at 12 Months CCA*

	Low Intensity					High Intensity							
	% of children who received service	Hours of Service				% of children who received service	Hours of Service						
Variable		$\bar{x}$	(SD)	n	Total		$\bar{x}$	(SD)	n	Total	T Value	p Value	ES^
Public Health Nursing	78	12.0	(19.3)	23	275	91	15.6	(17.4)	21	327	.65	.52	.19
Early Intervention	44	10.5	(19.5)	23	242	81	57.7	(83.0)	21	1,211	2.54	.02	2.42
PT/OT	13	15.3	(16.2)	23	353	71	14.7	(13.5)	21	309	.14	.89	-.04

^ Effect size is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ scores divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of ES).

* CCA refers to the child's age adjusted for prematurity.

of children in each group who received services, nearly twice as many of the infants in the more intensive intervention received early intervention services when compared with the infants in the less intensive group. Hours of service, as outlined in Table 7.3, indicates that five times more early intervention service hours were provided to the transition team infants than to the subjects in the traditional services group. In that one of the primary purposes of the transition team was to assist families in obtaining community-based early intervention services, these data confirm that that objective was reached.

Data about the family included an estimate of the quality of parent involvement by CCH project staff, a parent satisfaction questionnaire completed by parents at the 12-month posttest, and an estimate of how well the parents felt they were able to integrate the infant's programs into their daily routine were also collected at posttest. As discussed earlier in the description of the high intensity intervention, parents in the high intensity intervention were asked to spend 3 to 15 minutes per day in developmental activities with their child. Data were not collected to verify that parents complied with this goal. Parents were asked to rate their child's program on a scale of 1 - 4, with 1 reflecting poor ratings and 4 excellent ratings of program service. Mean scores ranged from 3.5 - 3.9. There were no differences between groups in terms of parent satisfaction with their child's progress or program. As almost all families received some form of PT/OT, nursing, or early intervention services, the parents' perception of how well they were able to integrate the program activities into their family routines was gathered and measured on a scale of 1-3, with 1 being the most able. There was no significant difference between the groups on the integration variable at the 12-month posttest.

EIRI staff also maintained weekly telephone contact with the project staff, conducted three yearly site visits, and conducted an annual onsite review of the project. A site review of the Columbus project was conducted August 23-24, 1990.

The purpose of this review was to collect information about the nature and quality of intervention services provided to the high- and low-intensity intervention groups, and to verify that the research conducted by EIRI was being implemented as intended. ***The Guide for Site Reviews of EIRI Research Sites*** was used to evaluate program components of the project, and included a general review of program philosophy, subject records and assessment procedures, observations of staff-child and staff-parent interactions, and a review of administration and management procedures.

The overall results of the Site Review were very positive. Comprehensive and coordinated services were provided to the early intervention group, and data were managed in an exemplary manner. Furthermore, a review of 12-month posttest data by the site review team indicated that there were substantial differences in the number and intensity of interventions received by each group. A full report of the site review is available from the site coordinator.

Cost of Alternative Interventions

The cost of delivering the intervention programs described above was determined using the ingredient approach (Levin, 1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we had no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1991). In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

The cost of early versus later intervention was determined by analyzing costs for both program alternatives on two levels (see Table 7.4). The first level consisted of the hospital-based transition team which coordinated services for the child on the local level following release from the hospital. The second consisted of the costs associated with the local agencies providing direct services to the children and families in the research study.

Transition team resources for children in both groups (see Table 7.4) included direct service and administrative personnel, occupancy, equipment, materials and supplies, travel, and miscellaneous expenses. Personnel resources allocated to children in the two groups differed according to the actual amount of time spent. the allocation of resources to the control group is explained in more detail below. Direct service personnel costs include salaries and benefits for the pediatrician, nurse, social worker, parent-infant educator, and an occupational therapist. Salary and benefits were also calculated according to the percentage of FTE worked on the project for program administrative personnel: project director, secretarial and support staff, and general hospital administration. The percentage of time devoted by the staff to the demands of the research were, of course, excluded from the costs

Table 7.4

Columbus Medically Fragile Project Costs (1990 Dollars)

	Low Intensity	High Intensity
1. **UNDISCOUNTED COSTS**		
Agency Resources		
Direct Services	$ 265	$ 2,900
Administration	203	2,231
Occupancy	51	562
Equipment	12	133
Transportation	31	338
Materials/Supplies	16	181
Miscellaneous	8	91
SUBTOTAL	$ 586	$ 6,436
Additional Services		
Public Health Nurse	$ 861	$ 1,121
Early Intervention Program	389	2,133
Physical/Occupational Therapy	1,148	1,102
Speech Therapy	48	22
SUBTOTAL	$2,446	$ 4,378
GRAND TOTAL	***$3,032***	***$10,814***
2. **DISCOUNTED COSTS (3%)**		
Total Agency Resources	$ 622	$ 6,828
Total Resources	3,068	11,206
3. **DISCOUNTED COSTS (5%)**		
Total Agency Resources	$ 646	$ 7,096
Total Resources	3,092	11,474

of the service project. Hospital administrative costs for direct service employees were based on the hospital's indirect rate for administration (.22 of direct expenses). Occupancy charges are based on the 1989 rate per square foot for space used by the program, including plant operation, housekeeping, maintenance, repairs, and insurance. The project used 328 square feet at $12.86 per square foot for space, $2.43 per square foot for plant operation, $7.21 per square foot for housekeeping, $14.73 per square foot for maintenance repairs and insurance, for a total of $37.23

per square foot. Equipment included office equipment and furniture used for 3.0 FTEs. Market replacement values were ascertained for each item and an annualization factor was applied to arrive at an annual cost accounting for interest and depreciation. Travel expenditures were based on actual mileage. The cost of materials and supplies and miscellaneous expenses were based on the project's annual expenditure on these items.

Transition team personnel costs for children in the low intensity group were minimal; the nurse spent time recruiting, testing, and collecting child and family medical data, chart keeping, etc.; the social worker set up appointments and coordinated the OT clinic where infant assessment and follow-up were done; the occupational therapist tested the children; and the pediatrician received visits from each child born in the NICU. All children born in the NICU, whether part of this study or not, receive these services. These are all costs associated with the direct services provided by the project. For each of these activities, the actual amount of time spent and the associated cost of the time was determined. This time cost is the direct service cost for the low-intensity group. To determine the proportion of direct service cost to allocate to the low intensity vs. high intensity cost, the total direct service cost for the two groups was calculated. The low-intensity group direct service cost portion of this total direct service cost was 9.4%. Thus, this proportion was used as the best estimate of the proportion of indirect service resources used by the low-intensity group.

As previously mentioned, cost analyses were also conducted to determine the cost per child in both groups for services received in the community. Here, the emphasis was on services which the child or family received as a direct result of the transition team intervention and were services related to the child's condition or disability. Thus, social services such as WIC or subsidized housing, or social worker services were excluded because these were not related to the child's disability. Also excluded were individual physician fees, private home nursing care and equipment costs, and the cost of the NICU and readmissions to the hospital. These costs were a function of the severity of the child's condition and were services the child/family would have received regardless of the efforts of the transition team.

From the additional services form, it was obvious that the transition team referred children and families to three main services: public health nursing (PHN), early intervention programs (EI), physical and occupational therapists (PT/OT), and speech therapy (ST). The costs for PHN, EI, PT/OT, and ST were determined by contacting representative agencies providing these services to young children throughout Ohio, Indiana, and Pennsylvania to determine an average cost. In the case of the public health nursing, cost information was generally available in cost per visit; thus, this is the unit used for PHN in the analysis. PHN cost per visit did not significantly differ between urban and rural locations due to the higher cost of transportation in the rural setting which offset the potentially higher personnel costs in urban settings. For PT/OT, ST, and EI, cost figures were generally available in cost per hour and this is the unit used in the present analysis. Costs for PT/OT, ST, and EI did vary from urban to rural settings; the estimate used is an average of urban and rural figures obtained because children in the study were approximately balanced between urban and rural settings. Cost estimates used for the analysis were: (1) public health nurse at $72 per visit, (2) early intervention services at $37 per hour, (3) PT/OT services at $75 per hour, and (4) ST services at $76 per hour.

An estimate of the quantity of services received was obtained from the additional services forms filled out by the parents at the 2 week, 6 month, and 12 month assessments. Parents were asked to report, from a list of services, the number of sessions attended, hours per session, total hours of service received, and the agency providing the services. Each form was studied for inconsistencies or incompletions, and followed-up with the transition team personnel and parents to obtain an accurate as possible estimate of the quantity of services received by each family in the study. Total hours for PHN, EI, PT/OT, and ST were tallied and multiplied by their respective costs per hour to determine total cost of these services in each group. These were divided by the number of children in the group to arrive at average cost.

All figures on Table 7.4 are in constant 1990 dollars. For purposes of the calculation of transition team cost per child, there were 21 children in the experimental group and 24 in the control group--the actual number of children served through 12 months at the time of this analysis; for additional services cost estimation, data were available for 23 in the control group and 21 in the experimental group. At the bottom of Table 7.4, transition team costs have been discounted using discount rates of 3% and %5. Additional services costs are current and, therefore, at the time of this report, not yet subject to the effects of discounting.

As Table 7.4 indicates, the transition team had a significant impact on whether the families sought and obtained early intervention services for their children. As shown in the previous section on treatment verification, children in the experimental group received five times as many hours of early intervention services as children in the control group (1,210.5 hours versus 242 hours). The transition team had a lesser impact on the amount of public health nursing visits received--327 visits for the experimental group and 275 visits for the control group children. There is a small difference between hours of PT/OT and ST received by children in each group which favors the low-intensity group. Total hours of PT/OT were 308.5 for high intensity and 352 for low intensity. While ST hours totaled 6 for the high intensity and 14.5 for the low intensity infants.

Overall, the transition team seems to have accomplished its goal of connecting children with early intervention services in their community. Thus, in addition to case management and referral, the transition team is providing an important child-find service. Due to random assignment, we can assume that there are at least as many children in the control group who are eligible for such services and are not receiving them. Since Ohio has decided to mandate services to infants and toddlers under Part H of P.L. 99-457, this is an especially interesting finding for the Department of Health who is the lead agency. In addition, the data suggest that public nurse home visits and whether or not the child receives PT/OT and ST services are probably independent of the transition team. In other words, children in both groups are balanced with respect to physical disability and will receive those services if they need them regardless of the existence of a transition team.

Data Collection

Data collected at the Columbus project included the results of outcome measures used across all EIRI sites and measures specific to this study. Outcome measures included assessments of both child and family functioning. As indicated earlier, infants were enrolled in the study approximately one month prior to their discharge from the NICU, and they were pretested two weeks following discharge. Pretest data were collected on 52 infants. Outcome data collected on subjects at 6, 12, and 18 months corrected age are presented. All EIRI assessments took place at CCH in conjunction with NICU follow-up clinic visits.

Recruitment, training, and monitoring of diagnosticians. In June 1988, diagnosticians were trained in Columbus by the EIRI Evaluation Specialist to administer the Battelle Developmental Inventory (BDI). Three diagnosticians were Registered Occupational Therapists employed in the Occupational Therapy Department of Columbus Children's Hospital. The fourth diagnostician was an Early Childhood Specialist employed in the Child Life Department of Columbus Children's Hospital.

While their work assignments involved in-patient and out-patient care, none of the therapists was assigned to the NICU or the Neonatal Follow-up Clinic. They evaluated the subjects as a part of their regular employment and were uninformed as to the purpose of the study and the group assignment of the infants.

Prior to the formal BDI training, the diagnosticians were required to become familiar with the BDI through a review of the test manuals, practice in scoring, viewing of a videotape of test administration procedures, and completing a self-mastery test. The diagnosticians then completed three practice BDI administrations. The third practice session was videotaped and reviewed by the EIRI assessment coordinator who then certified the diagnostician. In each year following certification, 10% of each diagnostician's test administrations were shadow scored for reliability by the onsite assessment coordinator. The assessment coordinator was responsible for tracking and scheduling evaluations for each subject. A more in depth discussion of test administration procedures is available in the EIRI 1986-87 annual report.

Schedule of assessment measures. Table 7.5 presents a schedule for the administration of assessment measures from enrollment to 18 months CCA (see Table 7.6 for a description of these measures).

Pretesting. Two weeks following discharge from the NICU, all infants in the study were scheduled for the first visit to the Neonatal Follow-up Clinic, where their health status, growth, pulmonary function, and rehospitalization record were evaluated. At that time, infant assessments also included the Battelle Developmental Inventory (BDI) and the Infant Neurological International Battery (the Infanib), a measure of neurologic integrity in the newborn and infant. The Parenting Stress Index (PSI), an assessment of the stress present in the parent-child system; the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the separateness or connectedness and adaptability of the family members to the family;

the Family Support Scale (FSS), a measure of different sources of support available to families with young children; the Family Resource Scale (FRS), a measure of the different kinds of resources available to the family; the Family Inventory of Life Events and Changes (FILE), which assesses the life events and changes experienced by the family during the previous 12 months; and the Parent Survey (demographic information) were completed by the parents. Parents were paid $20 for completing the pretest assessment battery. Tests and questionnaires were returned to EIRI for scoring, data entry, and storage.

Table 7.5

Schedule of Assessment Measures–Columbus Medically Fragile Study

	Enrollment	Discharge	Pretest--2 wks. Post Discharge	Assessments at 6 months CCA*	Assessments at 12 months CCA*	Assessments at 18 months CCA*
Battelle Developmental Inventory			X		X	
Parenting Stress Index			X		X	
Family Adaptability and Cohesion Evaluation Scales			X		X	
Family Support Scale			X	X	X	X
Family Resource Scale			X	X	X	X
Family Inventory of Life Events and Changes			X		X	
Additional Services Survey			X	X	X	X
Medical Severity Index	X	X				
EIRI Parent Survey			X		X	
Infant Neurological International Battery			X	X	X	
Medical Visit Summary		X	X	X	X	X
Bayley Scales of Infant Development				X		X
Vineland Adaptive Behavior Scales						X
Report of Child Health					X	
Parent/Child Interaction Video					X	

* Corrected Chronological Age (age corrected for prematurity)

Table 7.6

Description of Tests Administered for Columbus Medically Fragile Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Bayley Scales of Infant Development (Bayley, 1969)	Assesses developmental status of infants from age 2 months to 2½ years. This standardized test includes a Mental Scale, Motor Scale, and Infant Behavior Record.
Infant Neurological International Battery (Ellison, Horn, Browning, 1985)	Assesses infants from birth to 1½ years. It is used to test motor skills and assesses the neurological integrity of infants.
Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984)	This measure assesses individual performance for daily activities related to personal and social self-sufficiency. It measures adaptive behavior in four domains: Communication, Daily Living Skills, Socialization, and Motor Skills. This test is completed by the parent.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.

__6-month posttest__. The first posttest was scheduled when the infant was 6 months old (age corrected for prematurity). At this time, the infant received a physical examination and was assessed using the Bayley Scales of Infant Development and the Infant Neurological International Battery. At that same time, parents completed the Carey Infant Temperament Scale, the FSS, and the FRS. An additional services form reporting services that were used since pretest in conjunction with infant care and development, was completed in an interview with the social worker.

12-month posttest. A second outcome testing session was scheduled when the infants were 12 months (ages corrected for prematurity). At the posttest sessions, infants and their parents again completed the pretest battery. In addition, parents completed the Parent Satisfaction Survey and the Report of Child Health. The additional services data was provided by the parent during an interview with the social worker. At the 12-month posttest, parents and infants were videotaped during a scripted 16-minute period which included free play and structured activities. The videotapes are to be coded and scored as a measure of parent-child interaction.

18-month posttest. The outcome test at 18-months consisted of a physical examination, re-administration of the Bayley, the FSS, the FRS, and the additional services survey. In addition, parents completed the Vineland Adaptive Behavior Scales. Parents were paid $20 for completing each outcome test battery. Attrition was described earlier in Table 7.1 which describes the number of infants who have completed each posttest to date.

Results and Discussion

The purpose of the Columbus Medically Fragile study was to compare the effectiveness of comprehensive and coordinated early intervention services begun prior to the infant's discharge from the NICU (high-intensity) to a low intensity intervention consisting of medical follow-along and referral.

Comparability of Groups on Pretest Measures

The demographic characteristics for the subjects who were enrolled in the study is presented in Table 7.7. The demographic characteristics for the 44 infants who were in the study at the 12-month posttest are presented in Table 7.8. The differences between the groups at the two periods are small and consistent. Using a p-value $\leq$ .10, years of education of the father is the only difference at enrollment. At 12-months posttest, years of education of the father and hours worked have a p-value $\leq$ .10, in favor of the high intensity families. A pretest comparison of family demographic characteristics of all active subjects enrolled in the study and of those subjects included in Posttest #1 indicated that the high-intensity and low-intensity intervention groups were similar in all characteristics.

Table 7.7

Comparability of Groups at Enrollment on Demographic Characteristics for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
Variables	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Age of child in months as of 7/1/89	4.0	(4.9)	26	4.0	(5.2)	26	.96	.00
• Age of mother in years	25.6	(6.7)	26	27.3	(6.3)	26	.35	.25
• Age of father in years	29.6	(8.2)	25	30.4	(7.3)	24	.70	.10
• Percent male*	31	---	26	19	---	26	.35	-.24
• Years of education for mother	12.5	(2.0)	26	12.6	(2.4)	26	.75	.05
• Years of education for father	12.2	(1.2)	26	13.1	(2.3)	26	.10	.75
• Percent with both parents* living at home	76	---	25	77	---	26	.94	.02
• Percent of children who are* Caucasian	81	---	26	81	---	26	1.00	.00
• Hours per week mother employed	9.5	(15.4)	26	12.2	(17.1)	26	.55	.18
• Hours per week father employed	31.6	(18.8)	25	39.2	(16.6)	25	.14	.40
• Percent of mothers employed as* technical managerial or above	8	---	26	23	---	26	.13	.37
• Percent of fathers employed as* technical managerial or above	22	---	23	31	---	26	.49	.18
• Total household income♦	$25,540	($22,184)	25	$31,962	($27,495)	26	.36	.29
• Percent of children in daycare* more than 5 hours per week	15	---	26	4	---	26	.17	-.32
• Number of siblings	1.5	(1.8)	26	1.2	(1.3)	26	.48	-.17
• Percent with English as* primary language	96	---	26	100	---	26	.57	.16

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

♦ Income data were categorical and were converted by using the midpoint of each interval into continuous data.

Table 7.8

Comparability of 12-Month Posttest Groups on Demographic Characteristics for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES^
• Age of child in months at Pretest	1.7	(2.2)	23	1.8	(2.8)	21	.93	.05
• Age of mother in years	25.7	(7.2)	23	28.2	(6.1)	21	.23	.35
• Age of father in years	29.7	(8.7)	22	31.4	(6.9)	19	.49	.20
• Percent male*	35	---	23	14	---	21	.12	-.42
• Years of education for mother	12.4	(2.1)	23	12.7	(2.5)	21	.69	.14
• Years of education for father	12.2	(1.3)	23	13.4	(2.4)	21	.06	.92
• Percent with both parents* living at home	77	---	22	76	---	21	.94	-.02
• Percent of children who are* Caucasian	82.6	---	23	81.0	---	21	.89	-.04
• Hours per week mother employed	9.0	(14.8)	23	9.7	(15.6)	21	.88	.05
• Hours per week father employed	30.3	(19.8)	22	40.9	(15.8)	21	.06	.54
• Percent of mothers employed as* technical managerial or above	9	---	23	24	---	21	.18	.36
• Percent of fathers employed as* technical managerial or above	20	---	20	33	---	21	.35	.26
• Total household income♦	$26,614	($23,457)	22	$34,452	♦($29,666)	21	.34	.33
• Percent of children in daycare* more than 5 hours per week	4.3	---	23	23.8	---	21	.09	.49
• Number of siblings	1.4	(1.6)	23	1.3	(1.4)	21	.98	-.06
• Percent with English as* primary language	96	---	23	100	---	21	.62	.15

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the $\bar{X}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

♦ Income data were categorical and were converted by using the midpoint of each interval into continuous data.

A comparison of the medical characteristics of all infants in the high-intensity and low-intensity intervention groups at pretest (Table 7.9) indicated that the groups were similar on most of the medical severity measures. Table 7.10 presents this data for infants who were included at 12-month Posttest. The ES scores on technology dependence and feeding status indicate differences between the groups on these measures, one in favor of the low-intensity group, and the other in favor of the high-intensity group. A medical severity index incorporating these medical indicators was developed and used as a covariate in the analysis of outcomes presented in the Results section later in this report.

Table 7.9

Comparability of Groups at Enrollment on Medical Characteristics for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	X̄	(SD)	n	X̄	(SD)	n	P Value	ES^
Gestational age (Weeks)	31.0	(4.7)	26	31.1	(4.5)	26	.95	.02
Birthweight (grams)	1744.2	(861.2)	26	1615.1	(883.6)	26	.60	-.15
Severity Index at Enrollment (Range: 3 to 45)	15.3	(4.1)	26	14.2	(6.2)	26	.50	.27
Length of Hospitalization (Days)	102.4	(75.4)	26	118.6	(91.0)	26	.49	-.21
Total Doses of Medication Daily (at Pretest)	7.1	(9.5)	26	5.4	(9.0)	26	.50	.18
Technology Dependence (at Pretest)*	.7	(1.1)	26	1.2	(1.6)	26	.17	-.45
Feeding Status (at Pretest)*	2.5	(1.4)	26	1.9	(1.3)	26	.16	.43
Sensory Impairment (at Pretest)*	1.1	(.9)	26	1.1	(1.1)	26	.89	.00
Infant International Neurological♦ Battery (INFANIB) (Range: 20 to 100)	59.9	(6.4)	25	58.0	(7.4)	26	.64	-.30

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the x̄ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

* Technology dependence, feeding status, and sensory impairment at discharge were measured on a scale of 0-5 with low scores being more favorable.

♦ Higher scores on the INFANIB indicates greater neurological maturity.

Table 7.10

Comparability of Groups at 12-Month Posttest on Medical Characteristics for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES^
Gestational age (Weeks)	31.4	(4.9)	23	31.5	(4.9)	21	.98	.02
Birthweight (grams)	1719.6	(877.7)	23	1683.8	(946.0)	21	.90	-.04
Severity Index at Enrollment (Range: 3 to 45)	15.2	(4.3)	23	13.7	(5.7)	21	.33	.35
Length of Hospitalization (Days)	105.2	(79.3)	23	106.9	(82.5)	21	.95	-.02
Total Doses of Medication Daily (at Pretest)	7.4	(9.5)	23	4.5	(5.8)	21	.22	.31
Technology Dependence (at Pretest)*	.6	(1.2)	23	.8	(1.2)	21	.63	-.17
Feeding Status (at Pretest)*	2.0	(1.7)	23	1.2	(.9)	21	.04	.47
Sensory Impairment (at Pretest)*	1.3	(1.4)	23	.8	(1.2)	21	.17	.36
Infant International Neurological♦ Battery (INFANIB) (Range: 20 to 100)	58.8	(6.7)	22	58.4	(7.6)	21	.86	-.06

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

* Technology dependence, feeding status, and sensory impairment at discharge were measured on a scale of 0-5 with low scores being more favorable.

♦ Higher scores on the INFANIB indicates greater neurological maturity.

Tables 7.11 and 7.12 show infant pretest scores on the BDI and measures of family functioning for infants at enrollment and those who were in the 12-month posttest analysis. The groups were similar on all of the BDI domain and total scores. They were also similar on two measures of family functioning, the FACES and FILE. The groups differed significantly, however, on the FSS and FRS where families in the high-intensity intervention group reported greater availability of support and greater access to resources at the time of the pretest than did families in the low-intensity group. Families in the high-intensity group also reported less "other related" stress on the PSI than did families in the low-intensity group. Correlations between pretest family measures, for which there were pretest differences

Table 7.11

Comparability of Groups at Enrollment on Pretest Measures for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES[^]
• Age in months at pretest	4.0	(4.9)	26	4.0	(5.2)	26	.96	0
• Battelle Developmental[+] Inventory (BDI) Raw Scores for:								
Personal/Social	6.0	(4.1)	26	8.0	(6.6)	26	.21	.49
Adaptive Behavior	3.8	(2.8)	26	4.5	(3.9)	26	.47	.25
Motor	4.9	(4.4)	26	5.0	(4.7)	26	.98	.02
Communication	4.7	(2.1)	26	4.9	(2.6)	26	.82	.10
Cognitive	3.4	(2.9)	26	3.0	(3.5)	26	.61	-.14
TOTAL	22.9	(14.5)	26	25.3	(20.0)	26	.61	.17
• Parenting Stress Index (PSI)								
Child Related (range 47 to 235)	111.7	(23.3)	25	113.5	(25.1)	25	.79	-.08
Other Related (range 54 to 270)	138.9	(50.8)	25	117.0	(26.5)	25	.07	.43
TOTAL (range 101 to 505)	226.4	(54.2)	25	230.5	(45.4)	25	.77	-.08
• Family Adaptation & Cohesion[#,+] Evaluation Scales (FACES)								
Adaptation (range 10 to 50)	21.8	(5.6)	26	24.7	(7.4)	26	.12	.52
Cohesion (range 10 to 50)	37.8	(6.2)	26	39.0	(8.3)	26	.56	.19
• Family Resource Scale (FRS)[♣]	116.8	(18.4)	26	125.3	(17.4)	26	.09	.46
• Family Support Scale (FSS)[♣]	25.8	(9.6)	26	30.8	(10.4)	26	.08	.52
• Family Index of Life Events and Changes (FILE)	11.4	(5.2)	26	11.8	(7.6)	26	.83	-.08

[^] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the $\bar{X}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). For the PSI and FILE, the numerator of the ES is calculated as: Less Intensive - More Intensive, as lower scores are preferred. A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

[+] Statistical analyses for BDI Scores were conducted using raw scores for each of these scales and the results of these are presented.

[#] Scores for each subscale of the FACES are derived based on linear scoring where high scores are preferred.

[♣] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Positive ESs are considered better.

Table 7.12

Comparability of 12-Month Posttest Groups on Child and Family Measures for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES^
• Age in months at pretest	1.7	(2.1)	23	1.8	(2.8)	21	.90	.05
• Battelle Developmental+ Inventory (BDI) Raw Scores for:								
Personal/Social	5.9	(4.1)	23	7.6	(6.0)	21	.27	.41
Adaptive Behavior	3.9	(2.9)	23	4.7	(4.2)	21	.47	.28
Motor	5.1	(4.6)	23	4.8	(4.5)	21	.84	-.07
Communication	4.5	(2.0)	23	4.7	(2.6)	21	.79	.10
Cognitive	3.4	(3.1)	23	2.8	(3.3)	21	.51	-.19
TOTAL	22.8	(15.2)	23	24.7	(19.4)	21	.72	.13
• Parenting Stress Index (PSI)								
Child Related (range 47 to 235)	112.1	(23.1)	22	111.7	(23.8)	21	.95	.02
Other Related (range 54 to 270)	139.4	(53.6)	22	115.2	(27.4)	21	.07	.45
TOTAL (range 101 to 505)	224.1	(54.7)	22	226.9	(45.2)	21	.86	-.05
• Family Adaptation & Cohesion# Evaluation Scales (FACES)								
Adaptation (range 10 to 50)	21.7	(4.3)	23	25.3	(7.6)	21	.06	.84
Cohesion (range 10 to 50)	37.3	(6.0)	23	40.4	(7.7)	21	.15	.52
• Family Resource Scale (FRS)‡	116.8	(18.8)	23	126.0	(17.8)	21	.10	.49
• Family Support Scale (FSS)‡	26.3	(9.8)	23	32.0	(9.4)	21	.06	.58
• Family Index of Life Events and Changes (FILE)	11.6	(5.0)	23	12.1	(6.9)	21	.79	-.10

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). For the PSI and FILE, the numerator of the ES is calculated as: Less Intensive - More Intensive, as lower scores are preferred. A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

+ Statistical analyses for BDI Scores were conducted using raw scores for each of these scales and the results of these are presented.

Scores for each subscale of the FACES are derived based on linear scoring where high scores are preferred.

‡ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Positive ESs are considered better.

between the groups, showed no statistically significant differences. The correlations were near zero for those few which showed differences. As would be expected, high correlations were found between some of the pretest family measures and posttest family measures. Where these correlations were highest, the pretest variables were used as covariates in the analysis of outcomes.

Effects of High Intensity vs. Low Intensity Intervention on Measures of Child Functioning

Analysis of covariance (ANCOVA) procedures were used to evaluate differences between groups on measures of child and family functioning following the provision of intensive, coordinated early intervention transition services to one group of infants and less intensive routine medical follow along for the other group. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. For example, child-related stress (correlation = -.37) and level of severity at discharge (correlation = -.61) were used as covariates for 6-month Bayley raw scores. The combination of these variables reduced the amount of unexplained variance in the 6-month Bayley scores better than other combinations of pretest and demographic variables. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $p \leq .10$, and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977), in those cases where a covariate or set of covariates could be found which correlated with the dependent variable in question (which was almost the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 94% for finding moderate sized differences (defined by Cohen as differences of a half a standard deviation).

The ANCOVA results for the 6-, 12-, and 18-month child outcome measures are presented in Table 7.13. The results for the Infanib total score and Bayley motor and mental raw scores at the 6-month posttest indicate no statistically significant differences between the groups. The analysis of the BDI total and domain raw scores at 12-months posttest suggests that infants in the two groups were not significantly different on BDI Personal Social, Adaptive Behavior, Motor, Communication, or Cognitive scores.

The 18-month child outcome measures include the Bayley measures of motor and mental functioning and the Vineland Adaptive Behavior Scales with communication, daily living skills, and social domains. The results of the ANCOVA on these measures are presented in Table 7.13 and show no statistically significant differences between the low and high intensity intervention groups on any of these measures.

Table 7.13

Summary of Posttest ANCOVAs on Measures of Child Functioning for Alternative Intervention Group for Columbus Medically Fragile Study

		Low Intensity Group				High Intensity Group				ANCOVA	p	
	Covariate♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	Value	ES^
6-MONTH ANALYSES												
INFANIB⁺ Total	5,1	52.5	(15.7)	53.1	20	56.0	(10.2)	55.3	20	.31	.58	.14
Bayley⁺												
Motor	6,1	16.9	(7.5)	17.7	22	20.8	(7.0)	19.9	21	1.13	.29	.29
Mental	6,1	45.0	(26.1)	49.7	22	58.0	(24.5)	53.2	21	.30	.59	.13
12-MONTH ANALYSES												
Battelle Developmental Inventory⁺ (BDI)												
Personal/Social	7,1	26.2	(10.5)	27.0	22	31.6	(7.3)	30.8	21	2.03	.16	.36
Adaptive Behavior	6,1	20.0	(11.3)	20.7	22	23.0	(10.1)	22.3	21	.32	.57	.14
Motor	6,1	26.0	(15.3)	27.9	22	28.3	(14.2)	26.4	21	.15	.70	-.10
Communication	7,1	15.9	(7.9)	16.4	22	19.1	(6.7)	18.7	21	1.29	.26	.29
Cognitive	6,1	13.8	(7.2)	14.7	22	14.7	(5.8)	13.8	21	.28	.60	-.13
TOTAL	6,1	102.4	(50.2)	108.1	22	116.8	(40.9)	111.0	21	.06	.81	.06
Infanib⁺ Total	6,1	63.1	(23.3)	63.8	22	59.5	(21.5)	58.7	20	.69	.41	-.22
18-MONTH POSTTEST												
Vineland⁺												
Communication	1,2	21.6	(8.3)	21.8	22	21.8	(8.6)	21.5	20	.01	.91	-.04
Daily Living Skills	1,3	15.0	(9.2)	15.8	22	15.4	(8.5)	14.5	20	.32	.58	-.14
Social	1,4,5	28.1	(9.6)	28.6	21	31.1	(6.6)	30.6	20	.78	.38	.21
Bayley⁺												
Motor	1,6	38.1	(17.3)	38.0	20	38.8	(15.1)	39.1	20	.05	.83	.06
Mental	1,6	90.5	(41.9)	89.9	20	102.9	(28.5)	103.5	20	1.70	.21	.32

⁺ Vineland, Bayley, BDI, and Infanib statistical analyses were conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity vs. Low Intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

♦ 1 = Level of medical severity at enrollment, 2 = Family Resource Scale Total Score at Pretest, 3 = Level of sensory development at discharge, 4 = Education of mother, 5 = Whether or not the child is living with both parents, 6 = Parenting Stress Index--Child related raw score, 7 = Parenting Stress Index--other stress raw score.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Table 7.14 presents the results of the ANCOVA comparisons of posttest measures of family functioning. ANCOVA results indicated that groups were similar on most measures of family functioning at 6, 12, and 18 months CCA. The only difference,

Table 7.14

Summary of ANCOVAs on Measures of Family Functioning for Alternative Intervention Groups for Columbus Medically Fragile Study

		Low Intensity Group				High Intensity Group						
	Covariate♦	X̄	(SD)	Adj.X̄	n	X̄	(SD)	Adj.X̄	n	ANCOVA F	P Value	ES^
6-MONTH POSTTEST												
Family Support Scale	7,3	29.0	(12.4)	30.5	21	32.1	(8.4)	30.6	20	.00	.95	.01
Family Resource Scale	3,6	120.3	(12.5)	121.8	21	128.6	(13.8)	127.1	20	2.80	.10	.42
12-MONTH POSTTEST												
Parenting Stress Index♣												
Child Related (range 47 to 235)	3,9	111.1	(19.3)	109.1	22	105.3	(22.9)	107.4	21	.10	.76	.09
Other Related (range 54 to 270)	3,9	132.8	(23.8)	128.2	22	124.8	(31.2)	128.9	21	.00	.99	-.03
TOTAL (range 101 to 505)	3,9	240.0	(38.9)	238.3	22	234.3	(49.3)	240.0	21	.03	.87	-.04
Family adaptation and cohesion• Evaluation Scales (FACES)												
Adaptation (range 10 to 50)	3,7	21.8	(6.8)	22.5	23	23.0	(8.1)	22.4	21	.00	.98	-.01
Cohesion (range 10 to 50)	3,4	37.3	(6.6)	37.9	23	35.5	(9.5)	34.9	21	1.72	.20	-.45
Family Resource Scale (FRS)	3,6,10	116.6	(17.1)	119.7	23	126.9	(16.3)	123.8	20	.97	.33	.24
Family Support Scale (FSS)	7,10	25.7	(10.9)	25.5	23	29.0	(10.0)	29.2	20	1.33	.26	.34
Family Index of Life« Events and Changes (FILE)	1,2,5	8.4	(4.5)	8.3	23	8.3	(5.3)	8.5	21	.01	.91	-.04
18-MONTH POSTTEST												
Family Support Scale	3	23.9	(8.9)	24.1	22	28.4	(10.1)	28.1	20	2.10	.16	.45
Family Resource Scale	3,6	118.9	(17.4)	122.3	22	121.7	(16.1)	118.6	19	.97	.33	-.21

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). For the PSI and FILE, the numerator for the ES is calculated as: Less Intensive - More Intensive, as lower scores are preferred. A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

♣ A low raw score indicates lower stress level.

« A low raw score indicates lower stress level, and a positive effect size is more desireable.

• Scores for each subscale of the FACES are derived based on linear scoring where high scores are preferred.

♦ 1 = Battelle Total (at pretest), 2 = Years of education father, 3 = Years of education mother, 4 = Family Adaptation and Cohesion Evaluation Scales--Cohesion (FACES), 5 = Family Index of Life Events (FILE), 6 = Family Resource Scale (FRS), 7 = Family Support Scale--Total Score (FSS), 8 = PSI--child, 9 = Parent Stress Index--Other (PSI), 10 = Sensory Impairments (at enrollment), 11 = Severity Index--at enrollment (range 3 to 45).

using a p-value ≤ .10 is on the Family Resource Scale for the 6-month posttest. Families in the high-intensity group indicated by scores on the FRS that they had access to more resources than did the families in the low-intensity group. However, this difference did not exist for the 12 or 18 month posttests.

Subgroup Analyses

Rural service delivery. One variable which may have affected the efficacy of the transition team intervention relative to the services received by the infants in the low-intensity intervention was the county in which the family and child resided at the time of the intervention. Franklin county encompasses the Columbus urban area. The families and infants who participated in the study resided in Franklin County or one of 18 rural counties in southeastern Ohio. The transition services provided to the high-intensity group may have been more valuable to the infants and families who live in rural areas. The project was based in Franklin county at Columbus Children's Hospital. As mentioned in the section on the rationale for the study, most of the improvements and advances in perinatal care have been concentrated in the tertiary care hospital and environment. Infants and families who live near the hospital have easier access to treatment and early intervention services that are focused on their needs while those living in rural areas have limited access to services. Thus, the transition services provided to the high intensity group may have been more beneficial to the infants and families who live outside of Franklin county.

To examine whether there was a differential impact of treatment for infants in rural areas, all of the infants who resided in Franklin County during intervention were removed from the data. The rural high- and low-intensity groups were examined for pretest differences on demographic, medical, child, and family development variables. Significant differences were found for hours worked by the father and the Family Support Scale. The correlations between these variables and 6-, 12-, and 18-month outcomes were analyzed and covariates selected where correlations were significant. ANCOVA was completed for the 6-, 12-, and 18-month posttest measures of child functioning with only the rural infants who were assigned to the high- and low-intensity interventions. The results, which are presented in Table 7.15, show no significant differences on the 6-month Infanib, Bayley Mental, or Motor Scores. The 12-month posttest results on the BDI show significant differences on two of the domains. The BDI Personal/Social and Communication scores are significantly higher for the high-intensity rural infants with p-values of .05 and ES of .73 and .74, respectively. The 18-month Bayley and Vineland comparisons show no statistically significant differences between the rural low- and high-intensity subjects.

Severity. One of the conclusions of a recent review on the efficacy of early intervention was that one of the strongest predictors of developmental progress for infants and children is severity of impairment (Dunst, Snyder, & Mankinen, 1989). The level of severity of impairment may interact with early intervention services so that differential effects of the intervention result depending on whether the impairment is mild or severe. To examine whether interactions between severity and intervention occurred in this study infants were placed into a severe or mild disability category based on their medical severity index at pretest. As mentioned earlier in this report the medical severity index was computed from nine variables which included degree of technology dependence, oxygen dependence, respiratory status, age at discharge, neurologic status, ultrasound/CT findings, head circumference, feeding status, and sensory impairment. A group by severity of medical condition (2 x 2) analysis of covariance was then conducted for 6- and 12-month Bayley, Infanib, and BDI scores. The results of this analysis showed no statistically significant interaction effects between medical severity and the intensity of the intervention for the children in the two treatment groups.

Table 7.15

Summary of ANCOVAs on Measures of Child Functioning for Rural Intervention Groups for Columbus Medically Fragile Study

		Low Intensity Group				High Intensity Group						
	Covariate♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES^
6-MONTH POSTTEST												
INFANIB⁺ Total	1,2,9,17	54.1	(11.5)	56.5	15	56.2	(11.6)	53.8	13	.60	.45	-.23
Bayley⁺												
Motor	1,2,3	17.2	(7.3)	18.7	15	21.2	(7.4)	19.6	13	.12	.73	.12
Mental	1,3,18	42.6	(25.6)	51.8	15	56.4	(28.7)	47.1	13	.29	.59	-.18
12-MONTH ANALYSES												
Battelle Developmental Inventory⁺ (BDI)												
Personal/Social	3,5	25.6	(10.5)	25.4	14	32.9	(7.5)	33.1	14	4.42	.05	.73
Adaptive Behavior	7,10,13	19.4	(12.4)	20.5	14	23.4	(10.3)	22.2	14	.16	.70	.14
Motor	6,11	26.4	(16.6)	24.6	14	26.5	(15.0)	28.3	14	.41	.53	.22
Communication	6,9,12	15.3	(8.0)	15.2	14	21.0	(6.3)	21.1	14	4.50	.05	.74
Cognitive	4,14,15	13.6	(7.8)	14.6	14	14.1	(6.5)	13.2	14	.27	.61	-.18
TOTAL	6,9,11,16	101.0	(53.3)	97.1	14	117.9	(43.2)	121.8	14	1.35	.23	.46
Infanib⁺ Total	8,16	63.1	(25.7)	60.9	14	58.5	(22.9)	60.7	14	.00	.98	-.01
18-MONTH POSTTEST												
Vineland⁺												
Communication	1	20.6	(8.6)	21.3	14	23.2	(9.3)	22.5	13	.17	.67	.14
Daily Living Skills	1	16.4	(10.4)	17.4	14	16.1	(9.4)	15.1	13	.76	.39	-.22
Social	1	26.2	(10.3)	26.9	14	30.8	(7.7)	30.2	13	1.18	.29	.32
Bayley⁺												
Motor	1,6	38.6	(18.7)	38.8	14	35.4	(16.0)	35.3	13	.39	.54	-.19
Mental	1,6	88.9	(42.7)	90.5	14	98.8	(33.4)	97.1	13	.31	.58	.15

⁺ Vineland, Bayley, BDI, and Infanib statistical analyses were conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity vs. Low Intensity) on the adjusted $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

♦ 1 = Level of medical severity at enrollment, 2 = Family Resource Scale Total Score at Pretest, 3 = Child's age at pretest, 4 = Education of mother, 5 = Mother's age, 6 = Parenting Stress Index--Child related raw score, 7 = Parenting Stress Index--other stress raw score, 8 = Parenting stress index--total score, 9 = Battelle Adaptive Behavior Score, 10 = Battelle Personal/Social Behavior, 11 = Family Support Scale Total Score, 12 = Infanib score at pretest, 13 = Occupation of mother, 14 = Hours of daycare, 15 = Feeding status of infants, 16 = gender, 17 = ethnicity of child, 18 = FACES adaptability raw score.

Conclusions

The treatment verification data confirms that the intervention of the Columbus Medically Fragile Project was implemented as intended. The traditional intervention consisted of NICU referrals and follow-up while the transition team intervention provided home and center based visits, helped to develop and implement IFSPs and to develop relationships between families and local service providers to ensure that timely, appropriate services were actually provided. The treatment verification data shows that the transition team services were more intensive as measured by the direct services provided by the team and by differences in IFSP development at 18-month posttest. The groups also differed in the number of additional service hours, with the high intensity infants receiving significantly more early intervention service hours than the infants in the low-intensity intervention.

Overall, pretest comparisons indicate that randomization procedures have resulted in well-matched groups as the intervention phase of this project began. At enrollment, statistically significant differences were found on one demographic measure, none of the medical characteristics, none of the infants' developmental measures and three of the family measures. In light of the many different variables on which groups were compared, it was not surprising to find a few on which there were statistically significant differences between groups, suggesting the groups are comparable.

The analysis of covariance by intervention group for the six month Infanib and the six and eighteen month Bayleys show no statistically significant differences between the groups on neurological, motor or mental development as measured by these scales. The results of the twelve month BDI total and domain scores and the 18-month Vineland also show no statistically significant differences by group when the data for the 43 children who completed this posttest was analyzed.

The direct intervention provided to transition team infants was greatest between the time of enrollment and the 6-month posttest and had ended by about 12 months posttest. However, as shown by the additional services data the infants in the more intensive intervention were receiving more intensive early intervention services in their local communities at the time of the 12-month posttest. This difference, which may be attributed to the transition team follow-up with local service providers, may result in differences in later posttest assessment and analysis. It also raises the question of whether these differences between additional service hours for the two groups will continue over time and what will be the resulting consequences for child development in the two groups. Additional services data is currently being collected as the children reach 24 months corrected age so that the duration of this difference can be analyzed.

The subgroup analysis does not provide evidence that the intervention differentially impacted children depending on their level of medical severity. It provides some evidence that differences existed between the rural and urban infants on personal social and communication BDI scores at the 12-month posttest. However, there were many variables, at all posttests, which were not significantly different between the groups so that these results must be interpreted with caution. This rural analysis involved removing all infants in the Columbus Ohio urban area from the data. ANCOVAs were run on the child outcome measures for the rural infants. This resulted in significant differences, p-value $\leq$ =.10, for the personal social and communication domains of the BDI.

There are several possible explanations for the finding of these differences between the rural infants in the two intensity groups. First, only two measures at one of the three posttests showed differences so that it may be due to random fluctuation. However, the finding of the difference at the 12-month posttest rather than earlier or later gives more weight to the conclusion that the difference was due to the intervention as the transition team intervention was phased out after the 12-month posttest. Another possible explanation for the discrepancy between posttests relates to the different measures administered at each posttest. The 6-month posttest included the Infanib, which focuses on motor skills, and the Bayley Mental and Motor Scores. The 12-month posttest included the Infanib, and the BDI with personal social, adaptive, motor, communication and cognitive domains. At 18-months the Vineland communication, daily living skills and social domains were analyzed as well as Bayley motor and mental scores. If the intervention impacted communication and personal social skills it might have appeared on the Bayley Mental score. A study of the validity of the Battelle (Boyd et al., 1989) by correlating it to the Bayley showed a .45 correlation between the Bayley Mental DQ and the BDI Communication DQ and a correlation of .88 on the age equivalent scores. They do point out that the Bayley domains are most closely related to the BDI motor and cognitive domains which may explain why no differences appeared at the 6-month posttest. However, the Vineland, given at 18-months, incorporates both communication and social domains and shows no statistically significant differences between the groups in those areas. A comparison of the Vineland and the BDI (McLean et al, 1987) on children under 30 months showed correlations of .77 on social skills for the two measures and .87 on communication scores for the two measures. Overall the results are weak as they are not confirmed across posttests or across similar measures.

The high-intensity intervention cost approximately $7800 more than the low-intensity intervention. There is no evidence that the intervention was cost effective for urban infants. Infants who lived in rural areas scored about 1/2 a standard deviation higher on the BDI personal social and communication domains than low-intensity rural infants at one of the three posttests examined here. Nearly $6,000 of the difference in expenditure related directly to transition team services which were financed by federal grants while nearly $2,000 of the difference in the cost of services was from state and local expenditures on the Public Health Nursing and Early Intervention services. These costs must be weighed against the effects for rural infants. It is important to keep in mind the alternative uses of the $7800 and whether or not it would have a greater impact if allocated to different programming for these children and families or even to other programs for different families. The answer to these questions will become more definitive as the longitudinal follow-up of the children in this study continues.

DES MOINES PUBLIC SCHOOLS

Project #8

COMPARISON: Children with Mild to Severe Disabilities -- Center-based intervention plus parent involvement vs. center-based intervention only

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EIRI COORDINATOR: Mark Innocenti

LOCATION: Des Moines, Iowa

DATE OF REPORT: 11-12-1991

Rationale for the Study

Parent involvement is often considered an important part of early intervention programs for young children with disabilities. This belief is so strong that it has been incorporated into the law mandating services for these young children (P.L. 99-457). Unfortunately, the empirical support for this belief is not as clear as one might assume based on the P.L. 99-457 mandate (White, Taylor, & Moss, 1989). Concerns have been raised regarding the efficacy of parent involvement in general and, specifically, to what types of parent involvement are most beneficial to children and families (Casto & Mastropieri, 1986; White et al., 1989). This study examined the effects of adding one particular type of parent involvement to an existing center-based early intervention program for children with disabilities. The type of parent involvement program investigated as a part of this study included weekly parent meetings which focused on: a) training parents to work with their children on skills/behaviors, b) educating parents in various topics (such as legal rights, child assessment, child development, etc.), and 3) providing support to parents in the form of parent groups and assistance in accessing available resources.

Review of Related Research

The issue of parent involvement in early intervention has been a subject of many reviews of literature (Bronfenbrenner, 1974; Comptroller General, 1979; Datta, 1971; Floren & Dokekci, 1983; Karnes & Lee, 1978; Lazar & Darlington, 1982). These reviews have almost unequivocally concluded that early intervention programs which involve parents will be more effective than those that do not. In examining the research studies cited by these reviews, White et al. (1989) found that the individual results did not support the conclusions of the reviews. White et al. raised further concerns by concluding that the research cited in these reviews had focused only on children who are disadvantaged, was of relatively poor methodological quality, and had defined parental involvement only as using the parent as a supplemental therapist.

Extending their analysis, White et al. (1989) raised the question, "What are the effects of parent involvement programs on young children with disabilities and on their families?" Using data that had been prepared for a meta-analysis of early intervention (Casto & Mastropieri, 1986), White et al. compared effect sizes from 89 studies that used children with disabilities as subjects. All these studies included some type of parent involvement. These studies were divided into two categories for analysis: studies that included extensive/moderate parent involvement and those that included little/no parent involvement. The results of this analysis were equivocal with respect to degree of parent involvement (i.e., more parent involvement was not necessarily better). It should be made clear that not all these studies were examining parent involvement, only that these studies included parent involvement and the parent involvement could be coded.

Studies (from the above analyses) that specifically investigated the effect of parental involvement in early intervention for children with disabilities were individually examined. Unfortunately, the majority of these were indirect comparisons, confounded by differences in the interventions being compared. Only five studies were found, other than those being conducted by EIRI, that directly compared a parent involvement intervention with a no parent involvement intervention (Barnett, Escobar, & Ravsten, 1988; Henry, 1977; Miller, 1981; Minor, Minor, & Williams, 1983; Scherzer, Mike, & Ilson, 1976). Although these studies report positive effects of parent involvement, research methodology problems existed. In all these studies, parents were trained to provide some type of therapy.

The review by White et al. makes it clear that current beliefs regarding parent involvement in early intervention are not based on a clear research foundation. However, it is a moot point to argue whether parents should be involved, because parent involvement is required by law. Rather, questions that need to be asked are: "What is the best way to involve parents?" and "What types of benefits are derived from different types of parent involvement?" To begin this type of analysis, different types of parent involvement must be defined and potential benefits elaborated.

Peterson and Cooper (1989) delineated six aspects of parent involvement programs: (1) information provision, (2) professional partnership, (3) support network, (4) training, (5) respite care, and (6) informal contact with staff. For each aspect of parent involvement, a different outcome may be expected. However, Gatling and White (1987), in a review of 172 parent involvement studies, found that over 80% of studies focus on parent training (i.e., training parents as intervenors or therapist for their children) as either the sole or major focus of the parent involvement program. This focus requires data on child outcomes to gauge effectiveness. However, as the above review indicates, available data currently does not allow for empirically based decisions.

The possibility also exists that these six aspects of parent involvement overlap and that even though one aspect may be emphasized, positive outcomes are being realized in other areas of family functioning. For example, if using an ecological model (Bronfenbrenner, 1979; Dunst, 1986), parent involvement activities may affect aspects of family functioning that may impact on the child's later development and functioning (see Blacker, 1984; Kaiser & Fox, 1986), even though immediate child effects may not occur. For example, families of children with disabilities are likely to be highly stressed (Gallagher, Beckman, & Cross, 1983) and in possible need of assistance to continue functioning as a "normal" family unit. Parent involvement activities may reduce this stress. Unfortunately, research on the efficacy of parent involvement programs have not included the assessment of possible impact on family functioning, and impacts on these areas are primarily speculative.

As emphasized by the preceding brief review, there are a variety of unclear efficacy issues surrounding parent involvement that require examination. Problems in the parent involvement literature include equivocal effects from studies examining different levels of parent involvement on child developmental progress. Few studies have occurred that are free of treatment confounds, and methodological problems make the results of these studies suspect. Parent involvement has not been clearly defined across studies; although training the parent to act as an intervenor/therapist for their child is the most common intervention. Finally, most studies have failed to examine family functioning variables. The present study was designed to address these concerns in evaluating the effects of one particular type of parent involvement program.

Overview of Study

The purpose of this study was to investigate the effects of adding one type of parent involvement program to an existing center-based early intervention program. Since all of the children participated in the same center-based early intervention program, but only half of the children had parents who participated in the Parent Involvement program, differences at the conclusion of the study in measures of child and family functioning could be attributed to the presence or lack of the parent involvement component.

The curriculum for the parent involvement component (Parents Involved in Education [PIE]; Pezzino & Lauritzen, 1986) was structured to focus on those aspects that had been used most frequently in past research (i.e., training parents as an intervenor/therapist for their child). Providing parents with information and parent support issues were also included in the PIE, but the primary focus was on teaching parents to provide supplemental therapy to their children with disabilities. Interventions similar to the PIE are commonly offered as an addition to an established early intervention program (Gatling & White, 1987). The present study approached the question of parent involvement by comparing PIE as a supplement to a center-based intervention program vs. effects of the center-based program without PIE. This study assessed the impact of these interventions on child progress and family functioning across the time the intervention was in effect, and longitudinally.

In addition, this study investigated the issue of whether parent-attended meetings with a training (PIE I) or support-oriented (PIE II) focus were more efficacious (cf., White et al., 1989). Parent support as an appropriate focus for parent intervention activities is receiving attention and interest in recent literature (e.g., Dunst, 1986; Dunst et al., 1988; Hanline & Knowlton, 1988; Zeitlin & Williamson, 1988). However, no comparative information exists on the effect of a parent support intervention on children and families. In order to provide some preliminary information, parents who participated in PIE and whose children remained in the early intervention program for a second year participated in an intervention focused on parent support (PIE II; Durbala & Hollinger, 1988). Although the addition of the parent support component (PIE II) may be effected by the fact that these parents received the PIE I intervention, comparisons with cohorts receiving only PIE I and then receiving only center-based intervention should provide information regarding support as a focus of parent intervention.

Methods

Subjects participating in this study were served through the Des Moines Public School System. The Des Moines public schools serves all children with disabilities in the Des Moines School District from birth through 6 years of age. (The State of Iowa has had a law mandating a free and appropriate public education to children with disabilities from birth through 5 since 1975.) At the time this study was implemented, children with disabilities in the Des Moines Public Schools ages 0-2 were typically served through home-based intervention programs, while preschoolers with disabilities, ages 3-6, typically received intervention services in center-based (classroom) settings. The general philosophy of the Des Moines Public Schools was (and is) to provide high-quality educational services that maximized each child's individual potential. Programs were developed based on comprehensive individual assessments conducted by members of a multidisciplinary team. Parents were required to participate in the development of Individualized Education Plans.

Subjects participating in this study were served at the Phillips, Findley, and Perkins schools. This represents three of many neighborhood schools in the Des Moines Public School System in which preschoolers with disabilities were served. These schools were selected because teachers and professional support staff (psychologists, speech therapists, occupational therapists, social workers) who work in these schools were interested in conducting this research study in collaboration with EIRI. The liaison at Des Moines who was responsible for coordinating day-to-day activities of the research study was a school psychologist employed by the school district who had responsibilities at each of the three participating locations.

Subjects. The subjects enrolled in this project can be divided into two distinct cohorts (see Figure 8.1). Cohort #1 consisted of those subjects enrolled during the 1986/87 academic year. There were 56 subjects in this cohort (30 control, 26 experimental), 40 of whom were male. The subjects ranged in age from 35 to 72 months at the time they became involved in the research. Cohort #2 consisted of those subjects newly enrolled during the 1987/88 academic year. There were 20 subjects in this cohort (12 control, 8 experimental), 15 of whom were male. The age of subjects in this cohort ranged from 36 to 72 months when intervention began. A subgroup of the first cohort consisted of those subjects who participated in the research for 2 years. This subgroup consisted of 34 subjects (15 control, 19 experimental), 22 of whom were male. These subjects ranged in age from 35 to 61 months when their participation began.

This report will examine data collected through Summer '90 and some of the data collected during Summer '91. Summer '91 data have been collected but Posttest #5 data for Cohort 1 subjects are not available for analyses. Posttest #1 included all subjects from the 1986/87 and subjects newly enrolled from the 1987/88 academic years (see Figure 8.1). All subjects had received one year of intervention at Posttest #1. This group was comprised of 76 subjects (42 control, 34 experimental), 55 of whom were male. These subjects ranged in age from 35 to 72 months at the time they began participation in the research. All subjects were identified as being disabled. Approximately 75% of these subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive and language impairments. The degree of disability for all subjects ranged from severe to mild. The majority of subjects were mild to moderately delayed, 55% had developmental quotients (based on the BDI Total score) below 65.

Intervention	n	Fall 86	Spring 87	Fall 87	Spring 88	Summer 89	Summer 90	Summer 91
Only PIE I (Yr. 1)	7	Pre*	Post 1*		Post 2	Post 3	Post 4	Post 5
PIE I and II (Yr. 1 and 2)	19	Pre	Post 1		Post 2	Post 3	Post 4	Post 5
Only PIE I (Yr. 2)	8			Pre	Post 1	Post 2	Post 3	Post 4
No PIE I (Yr. 1)	15	Pre	Post 1		Post 2	Post 3	Post 4	Post 5
No PIE I or II (Yr. 1 and 2)	15	Pre	Post 1		Post 2	Post 3	Post 4	Post 5
No PIE I (Yr. 2)	12			Pre	Post 1	Post 2	Post 3	Post 4

Figure 8.1: Group Assignment Information and Posttesting Schedule by Academic Year for the Des Moines Study

*Pre = Pretest

*Post(#) = Posttest (number indicating which posttest)

Posttest #2 includes subjects who continued in the early intervention program (15 control, 19 experimental) and subjects who "graduated" to school-age programs (27 control, 15 experimental). Subjects who continued in the program are those who were referred to earlier as the subgroup of the first cohort. The degree of disability for these subgroup subjects varied, and 60% had developmental quotients (based on the BDI Total Score) below 65. Approximately 70% of these subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive impairments.

At Posttest #3, all subjects had "graduated" from the intervention program as defined by the research project. At Posttest #3, approximately 75% of the subjects were in elementary school programs. The remaining subjects stayed in the preschool intervention program. No parent involvement activities, other than those described later in the center-only program, were provided to those who remained in preschool intervention.

Posttest #4 includes information for Cohort #1 and Cohort #2 children. All Posttest #4 children were in elementary school programs.

Recruitment. Parents of children in participating schools who were scheduled for preschool placement at the beginning of the academic year were considered for inclusion in the study if the following criteria were met: (a) One parent was not working or the parent could guarantee time off from work (this was done to help ensure parents had time available to attend parent meetings); and (b) the child was not profoundly retarded (preschool program staff were of the opinion that the needs of parents of these children would not be best met through the PIE). Parents of children at the participating schools who met these criteria were individually approached by preschool program staff. Preschool staff described the research and detailed parent and staff requirements. Placement in study group by random assignment procedures was described. If interested, parents returned an informed consent letter that clarified their requirements for, and potential benefits of, participation, and that stated that assignment to groups would be randomly determined. Approximately 95% of the parents who were approached regarding the research agreed to participate.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups prior to the initiation of treatment, either to a group in which parents received the PIE (Center + PIE) or to a group in which parents received no additional involvement other than what was provided to all parents through the center-based program (Center Only). Both groups continued to receive the same level of center-based services that were previously available through the school's program for preschoolers with disabilities.

To increase the probability of having comparable groups, subjects were randomly assigned to groups after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (35-42 months, 43-54 months, and over 55 months) and level of parent motivation (either "high" or "low") as perceived by each child's teacher. Categorizing subjects in this way resulted in subjects falling into one of six mutually exclusive categories. Within each of the six categories, subjects were rank ordered from low to high based on their scores on the CAPER (Continuum of Assessment Programming, Evaluation, and Resources; Carran, 1983). The CAPER, a teacher-administered test of developmental functioning, had been administered by school personnel at an earlier date.

After subjects were categorized, they were alternately assigned to one of the two conditions. Group determination of the first-listed subject (the subject with the lowest CAPER score) in each age by motivation category was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups based on randomly predetermined sequences. Subjects that participated for 2 years remained in the originally assigned group.

Demographic characteristics. Demographic characteristics are described below for subjects participating in each of the posttests. Seventy-six subjects received one year of intervention (Posttest #1). Subjects for this study represented a fairly homogenous sample (see Table 8.1). The majority of subjects were Caucasian males with one sibling. The parents of the subjects were generally in their late 20s or early 30s and had a high school education. The majority of subjects' families were intact, in that both parents lived at home; and traditional, in the sense that the mother was the primary caregiver. English was the primary language for all families. According to family income, the typical family would be considered lower to middle class.

Table 8.1 presents data for subjects who received one year of intervention by group on demographic characteristics. Some discrepancies between the Center-Only and Center + PIE groups are indicated. Mothers of subjects in the Center + PIE group tended to be older than mothers of subjects in the Center-Only group, and they also had higher levels of education. Fathers of Center + PIE subjects were much more likely to hold occupations placing them in higher SES categories. In addition, household income for families of subjects in the Center + PIE group tended to be higher than that for Center-Only subjects' families. Thus, in spite of the random assignment procedures, there was a slight bias in demographic characteristics favoring the Center + PIE group. Variables where such discrepancies occurred were considered as covariates in later analyses.

On measures that present demographic information on fathers, data are presented from a smaller "n" than many other variables. This can be partly attributed to data collection methods. Mothers were the primary providers of demographic and family functioning measures. In the majority of cases where "father data" was not obtained, it was not obtained from families where the father was not living at home.

Table 8.1 also presents demographic data on subjects who received Posttest #2, Posttest #3 and Posttest #4. In each case, there was some additional attrition from

Table 8.1

Comparability of Groups on Demographic Characteristics for Des Moines Parent Involvement Study

	Posttest #1								Posttest #2							
	Center Only			Center + PIE					Center Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^
● Age of child in months at pretest	53.0	(11.7)	42	52.3	(11.9)	34	.82	-.06	52.0	(11.5)	37	52.0	(11.8)	33	.93	.00
● Age of mother in years at pretest	28.2	(5.6)	40	30.8	(4.8)	33	.03	.46	28.0	(5.9)	35	31.0	(4.8)	32	.05	.51
● Age of father in years at pretest	30.3	(6.8)	33	33.1	(6.1)	27	.12	.41	31.0	(7.0)	28	33.0	(6.2)	26	.24	.29
● Percent Male*	71.4		42	73.5		34	.84	.05	68.0		37	76.0		33	.46	.22
● Years of Education for Mother	11.4	(2.2)	42	12.7	(1.9)	34	.01	.59	11.7	(1.9)	37	12.7	(2.0)	33	.04	.53
● Years of Education for Father	11.8	(2.2)	32	12.8	(2.6)	31	.13	.45	12.0	(2.3)	27	12.7	(2.7)	30	.25	.30
● Percent with both parents* living at home	66.7		42	70.6		34	.72	.10	65.0		37	70.0		33	.67	.12
● Percent of children who* are caucasian	80.5		41	91.2		34	.19	.41	81.0		36	91.0		33	.23	.40
● Hours per week mother employed	6.6	(12.0)	41	5.1	(11.0)	34	.69	-.13	5.0	(10.2)	36	5.3	(11.2)	33	.91	.03
● Hours per week father employed	32.1	(22.6)	27	33.3	(22.3)	29	.84	.05	34.2	(22.4)	23	33.1	(22.6)	28	.86	-.05
● Percent of mothers* employed as technical/ managerial or above	5.0		40	2.9		34	.66	-.13	6.0		35	3.0		33	.60	-.18
● Percent of fathers* employed as technical/ managerial or above	10.3		29	37.9		29	.01	.84	13.0		24	39.0		28	.03	.77
● Total household income	$14,307	($15,496)	39	$21,632	($18,323)	34	.07	.47	$14,309	($15,840)	34	$22,091	($18,408)	33	.07	.49
● Percent with mother as* primary caregiver	95.0		40	97.1		34	.66	.13	94.0		35	97.0		33	.60	.18
● Percent of children in daycare	35.9		39	35.3		34	.96	-.01	32.0		34	36.0		33	.73	.10
● Number of siblings	1.3	(0.8)	41	1.5	(0.8)	34	.42	.25	1.3	(0.8)	36	1.5	(0.8)	33	.17	.25
● Percent with English* as primary language	100		41	100		34	---	.00	100		36	100		33	---	.00

(continued)

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0"

^ $ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center only)}}{\text{SD (Center Only)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

"---" indicates t-test could not be conducted because of no variance in one group.

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Table 8.1 (continued)

Comparability of Groups on Demographic Characteristics for Des Moines Parent Involvement Study

	Posttest #3								Posttest #4							
	Center Only			Center + PIE					Center Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^
● Age of child in months at pretest	52.0	(11.9)	37	52.0	(11.3)	31	.90	.00	52.2	(12.0)	37	52.4	(12.0)	34	.96	.02
● Age of mother in years at pretest	28.0	(5.8)	35	31.0	(4.9)	30	.06	.52	28.1	(5.8)	35	30.8	(4.8)	33	.04	.47
● Age of father in years at pretest	31.0	(7.0)	28	32.0	(4.8)	24	.36	.14	30.8	(7.0)	28	33.1	(6.1)	27	.21	.33
● Percent Male*	68.0		37	74		31	.56	.17	67.6		37	73.5		34	.60	.16
● Years of Education for Mother	11.6	(2.0)	37	12.7	(1.8)	31	.02	.55	11.6	(2.0)	37	12.7	(1.9)	34	.02	.55
● Years of Education for Father	11.8	(2.4)	27	12.8	(2.5)	28	.13	.42	11.8	(2.4)	27	12.8	(2.6)	31	.16	.42
● Percent with both parents* living at home	70.0		37	68.0		31	.83	-.07	70.3		37	70.6		34	.98	.01
● Percent of children who* are caucasian	83.0		36	90.0		31	.41	.27	83.3		36	91.2		34	.33	.32
● Hours per week mother employed	5.9	(11.3)	36	5.6	(11.4)	31	.91	-.03	5.9	(11.3)	36	5.1	(11.0)	34	.76	-.07
● Hours per week father employed	32.8	(22.9)	24	34.1	(22.5)	26	.84	.06	32.8	(22.9)	24	33.3	(22.3)	29	.93	.02
● Percent of mothers* employed as technical/managerial or above	6.0		35	3.0		31	.63	-.15	5.7		35	2.9		34	.56	-.20
● Percent of fathers* employed as technical/managerial or above	13.0		24	38.0		26	.04	.75	12.5		24	37.9		29	.18	.73
● Total household income	$15,309	($15,916)	34	$21,016	($15,942)	31	.15	.36	$15,309	($15,916)	34	$21,632	($18,323)	34	.13	.40
● Percent with mother as* primary caregiver	94.0		35	97.0		31	.63	.15	94.4		35	97.1		34	.58	.20
● Percent of children in daycare	37.0		35	32.0		31	.68	-.12	37.1		35	35.3		34	.88	-.05
● Number of siblings	1.4	(0.8)	36	1.6	(0.8)	31	.27	.25	1.4	(.8)	36	1.5	(.8)	34	.58	.13
● Percent with English* as primary language	100		36	100		31	---	.00	100		36	100		34	---	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0"

^ $ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center only)}}{\text{SD (Center Only)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

"---" indicates t-test could not be conducted because of no variance in one group.

the study. Differences between groups noted earlier generally continued from posttest to posttest, suggesting a slight bias, based on demographic characteristics, in favor of the Center + PIE group.

Attrition. Eighty-six subjects were originally assigned to one of the groups. Of those, 76 subjects completed one year of intervention. All 10 subjects who did not complete one year of intervention were in the Center + PIE (experimental) group. For all 10 cases, withdrawal from the study was based on parent request to be removed from intervention.

No attrition has occurred with those subjects enrolled in intervention for two consecutive years or from Cohort #2 subjects. Of those subjects who "graduated" into the school-age program, six were lost to attrition during Posttest #2. Five were center-only subjects, and one was a Center + PIE subject. In the Center-only group, one family chose to discontinue participation, one family had moved, one child had recently been institutionalized and permission to test was not obtained, and the parents of two children refused testing at that time. In the Center + PIE group, the parent of one child refused testing at that time.

Eight subjects were lost to attrition at Posttest #3 (total n = 68). Five of these subjects were from the Center-only group, and three were from the Center + PIE group. The reasons for not testing the Center-only subjects were the same as at Posttest #2. In the Center + PIE group, the parents of two children refused testing, and one child could not be located. Once again, none of the Cohort #2 subjects were lost to attrition.

At Posttest #4, 71 subjects were tested. Only 5 children from Cohort #1 were unavailable for testing. All these were Center-only subjects and were the same five that had not been tested during past years. All Cohort #2 subjects were tested.

At Posttest #5, 50 Cohort #1 subjects have been tested. Six children were unavailable for testing. Four of these children were center-only subjects, two were

Center + PIE subjects. Two of the five center-only subjects who had not been tested at recent posttests agreed to participate, but one (previously participating) center-only subject's family refused testing. Of the two center + PIE subjects who did not participate, one was in foster care and permission to test could not be obtained and the parents of the other child refused testing. Cohort #2 subjects are not scheduled for Posttest #5 until Summer 1992.

Attrition analysis. To examine the effect of subject attrition on the pool of subjects during intervention, attrition analyses on demographic and pretest variables were conducted on the 10 subjects who dropped during the first year of intervention. Where all attrition occurred in the Center + PIE group, the attrition analysis compared these subjects only with those that remained in the Center + PIE group. These data are presented in Tables 8.2 and 8.3.

Of the 29 variables examined for differences between those subjects who remained in the study and those who dropped out, there was a statistically significant difference on only one pretest score from the Family Support Scale (FSS). Parents who dropped from the training group reported less support as measured by the FSS. These analyses indicate that attrition was not systematic and did not bias the outcome of the intervention.

Intervention Programs

The Des Moines Public School System provided educational services to preschool-aged children, ages 3 through 6, who exhibited developmental delays or who had disabilities. These children received center-based (classroom), half-day, 5-day-per-week intervention services. Children received services in educational formats (i.e., large group, small group, and one-to-one) according to their individual needs from special education teachers and teacher associates (paraprofessionals). Language and motor therapists assessed children, provided teachers with objectives, helped

Table 8.2

Attrition Analysis on Demographic Characteristics of Subjects Who Remained or Dropped from the Des Moines Parent Involvement Study

	Remained♦			Dropped				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^
• Age of child in months at pretest	52.3	(11.9)	34	48.4	(12.5)	10	.37	.32
• Age of mother in years at pretest	30.8	(4.8)	33	28.7	(5.0)	9	.24	.43
• Age of father in years at pretest	33.1	(6.1)	27	35.0	(5.9)	7	.46	-.32
• Percent Male*	73.5		34	80.0		10	.69	-.09
• Years of Education for Mother	12.6	(1.9)	34	12.0	(1.8)	10	.35	.32
• Years of Education for Father	12.8	(2.6)	31	12.4	(3.5)	8	.72	.14
• Percent with both parents* living at home	70.6		34	60.0		10	.54	.30
• Percent of children who are* caucasian	91.3		34	70.0		10	.21	.79
• Hours per week mother employed	5.1	(11.0)	34	6.4	(13.6)	9	.76	-.11
• Hours per week father employed	33.3	(22.3)	29	28.0	(26.8)	5	.64	.23
• Percent of mothers* employed as technical managerial or above	2.9		34	0.0		10	---	.21
• Percent of fathers* employed as technical/managerial or above	37.9		29	33.3		6	.84	.03
• Total household income	$21,632	($18,323)	34	$27,400	($28,417)	5	.54	-.30
• Percent with mother as* primary caregiver	97.1		34	100.0		9	---	-.26
• Percent of children in* daycare	3.5		34	4.4		9	.62	-.46
• Number of siblings	1.5	(0.8)	34	1.4	(1.4)	10	.88	.10
• Percent with English as* as primary language	100.0		34	100.0		10	---	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0."

^ $ES = \frac{\bar{x}\text{ (Remained)} - \bar{x}\text{ (Dropped)}}{\text{SD (Pooled)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

"---" indicates t-test could not be conducted because of no variance in one group.

♦ All subjects who dropped were in the Center + PIE group. Therefore, only subjects who remained in the Center + PIE groups are used in these comparisons.

Table 8.3

Attrition Analysis on Pretest Measures of Subjects Who Remained or Dropped from the Des Moines Parent Involvement Study

	Remained[*]			Dropped				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Battelle Developmental[*] Inventory (BDI)								
DQs for:								
Personal/Social	67.5	(18.5)	34	61.4	(11.4)	10	.22	.45
Adaptive Behavior	63.1	(22.1)	34	66.9	(10.8)	10	.88	-.06
Motor	62.6	(22.0)	34	68.9	(16.3)	10	.89	-.05
Communication	57.5	(20.6)	34	58.0	(20.2)	10	.69	.14
Cognitive	64.0	(19.6)	34	66.0	(20.0)	10	.62	.18
TOTAL	62.6	(16.7)	34	62.9	(11.7)	10	.66	.16
• Parenting Stress Index (PSI)[♦]								
Child Related (range 30 to 250)	117.4	(18.4)	34	119.0	(15.0)	10	.80	.09
Other Related (range 54 to 270)	131.6	(28.8)	34	122.1	(19.2)	10	.34	-.35
TOTAL (range 101 to 505)	248.9	(43.3)	34	241.1	(29.5)	10	.60	-.19
• Family Resource Scale[♠] (FRS) (range 30 to 150)	116.3	(19.5)	34	117.2	(19.0)	10	.89	-.05
• Family Inventory of Life[♦] Events (FILE) (range 0 to 71)	12.0	(8.0)	34	9.1	(7.4)	10	.32	-.37
• Family Support Scale (FSS)[δ] Total Score (range 0 to 4)	2.2	(0.8)	33	1.7	(0.4)	10	.02	.68

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease in interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing. ES and p value are based on raw scores.

[♠] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[δ] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[^] $ES = \dfrac{\bar{x}\text{ (Remained)} - \bar{x}\text{ (Dropped)}}{\text{SD (Pooled)}}$ The sign of the ES is reversed for the PSI, FILE, and FACES, as lower scores are preferred.

[*] All subjects who dropped were in the Center + PIE group. Therefore, only subjects who were in the Center + PIE group are used in these comparisons.

teachers integrate instructional therapeutic activities into on-going routines, and provided individualized services as needed. Teachers were free to use various curricula or to develop their own objectives when developing intervention goals and strategies.

The Des Moines Public School Early Intervention Program provided services to a wide variety of children with disabilities, from those exhibiting mild delays to those exhibiting more severe disabilities. The majority of children served were Caucasian, and a wide variety of SES levels were represented. As part of these services to children, parents were regularly involved in IEP meetings; teachers attempted to include and keep parents informed of classroom activities as child and parent needs dictated. In practice, this resulted in regular contacts with parents regarding child progress and participation at IEP meetings, but little else.

The purpose of the research study was to compare the effects of their current service delivery system with the same system enhanced by the inclusion of one type of systematic parent involvement. In both the control and experimental conditions, children received services in the center-based Des Moines Public School Early Intervention Preschool Program. No changes were made to this system for the purposes of the study. Children in the center and parent involvement (center + PIE) intervention were not segregated by classroom or teacher in the center-based service (i.e., all classrooms contained children in both groups). In the experimental group, parents of children enrolled in the early intervention program were exposed to a systematic parent curriculum. In their first year of involvement, parents were involved in the Parents Involved in Education (PIE I) package (Pezzino & Lauritzen, 1986). Parents whose children remained in the program for a second year and were in the experimental group were involved in the Parents Involved in Education II (PIE II) package (Durbala & Hollinger, 1988). Data on group assignment were presented earlier in Figure 8.1.

Center-only intervention. Children assigned to this group attended an existing center-based, half-day, 5-day-per-week intervention program in which they received small group and individualized teaching sessions from special education teachers and paraprofessional aides. All teachers were certified and were responsible for supervision of their respective aides. None of the aides were certified as teachers. The training for aides consisted mostly of periodic inservices provided by the school district that both teacher, aides, and support staff attend, and on-the-job training provided by their respective teachers and the collaborating speech and motor therapists. Each class of approximately 10 children had one special education teacher and one aide. Because each child's program was "IEP driven," motor and speech therapists' contact with children varied widely. In general, a motor and speech therapist was present in each class for the equivalent of 1-day-per-week. During a typical day, children were instructed in the motor, speech and language, self-help, cognitive, and social skills areas. As part of the regular services to children, parents were involved in IEP meetings, and teachers provided parents with IEP updates.

The CAPER, along with other curriculum-linked assessment tools, were used in determining intervention goals and strategies. Intervention activities were developed from comprehensive assessments and items drawn from a number of curricula. Teachers were free to select curriculum based on child need. The skill sequences in the curricula used extended beyond the child's current level of functioning, and functional skill training routines were included in the curricula to the degree appropriate.

Center + PIE intervention. In addition to the center-based service described above, parents of children in this group were offered parent meetings organized around the PIE curricula. PIE I training modules were taught by the preschool program support staff and were designed to provide parents with a systematic, conceptual, and hands-on experience in areas such as child development, observation and recording, targeting intervention behaviors, teaching processes, decision making, and communicating with professionals. The training format consisted of small-group lecture, discussion, and demonstrations. The average small group size was between 8 and 12 parents. PIE sessions consisted of 16, 2-hour meetings presented roughly once per week. PIE sessions also included a social support component in which parents had the opportunity to share feelings and express problems, challenges, and other issues associated with their lives. Parents were primarily responsible for determining the agenda for the social support component of the session. This occupied the last 15 minutes of the session and focused on issues such as problems with relatives, finding day care, etc. In addition to these sessions, parents were asked to practice the training activities at home with their children. They were asked to choose a target behavior for the child (such as a self-help or behavioral skill; e.g., compliance, dressing, etc.), implement an intervention program, and measure progress by comparing successful completion of the task before and after the intervention.

Parents whose children remained in the preschool program for a second year continued in a systematic, parent intervention, but through a different intervention package. The children continued in appropriate center-based services. Parents attended meetings structured by the *Parents Involved in Education II (PIE II)* curriculum (Durbala & Hollinger, 1988). The PIE II was developed based on a parent needs assessment and focused on parent support issues. Issues addressed included: dealing with parent stress, developing parent communication skills, teaching problem-solving skills, and providing information on areas of interest. The training format for PIE II was the same as PIE I, except 12 sessions were held. Parent home activities that were presented focused on support (e.g., practice parent-focused stress reduction technique, dealing with emotional issues of siblings) rather than child training issues. As in PIE I, a social support component was available at the end of each session.

PIE I and PIE II were conducted by preschool program support staff (e.g., school psychologist, speech and language therapists, consultant, nurse). Classroom teachers and aides were not involved in the PIE meetings and were only indirectly aware of the goals of PIE. Each PIE group was facilitated by a team of two staff members. All parent facilitators received instruction in PIE I and PIE II by their respective developers prior to its initial implementation. Meetings were primarily attended by the children's mothers. Table 8.4 lists session topics for PIE I and PIE II

The intent of the PIE I sessions was primarily to give parents the knowledge and abilities that would enable them to serve as interventionists in the home setting. PIE I was based on the philosophy that child progress can be maximized by training parents as interventionists and that the skills parents learn (i.e., their success as an interventionist) will allow the family to more competently function (i.e., by reducing parent stress and uncertainty). In contrast, although the primary intent of PIE II was also to provide knowledge, the knowledge dealt more with information on the effect of a child with a disability on the family, and strategies to normalize the functioning of the family. The philosophy behind this approach ties into the ecological model of development (Bronfenbrenner, 1979), in that positive changes in the family are expected to have positive effects on each individual family member. In addition to the PIE, parents in the Center + PIE group were provided the opportunity to attend four sessions conducted by the school nurse. These sessions focused on involvement of both spouses, where possible, and on facilitating communication between families. These sessions were informal in nature and focused on a topic such as a discussion on child nutrition, and on activities (e.g., a family swim night, making gifts at Christmas time).

Table 8.4

Content of PIE I and PIE II

Session	Topic
PIE I	
1.	Introduction and overview
2.	Objective observation of child behavior
3.	Defining and measuring behavior
4.	Principles of behavior management
5.	Analyzing behavior chains
6.	Theories of child development
7.	Testing and assessment
8.	Criterion-referenced assessment
9.	Developing learning objectives
10.	P.L. 99-457 and IEPs
11.	Intervention strategies
12.	Factors related to teaching success
13.	Practice teaching session
14.	Determining appropriate interventions
15.	Communicating with professionals
16.	Review, comments, concerns, questions
PIE II	
1.	Parent needs assessment and introduction
2.	Child development and behavior management
3.	Stress reduction
4.	Strategies for improving social and language skills
5.	Strategies for improving self-help and cognitive skills
6.	Communication
7.	The grief process
8.	Community services
9.	Feelings of siblings and extended family members
10.	Understanding my child's rights: Dialogues with professionals
11.	Promoting family fun
12.	Review, questions, and evaluation

Impacts on Treatment

During and after intervention, the possibility of uncontrolled events occurring either within or external to the intervention exists. These uncontrolled events can potentially impact on outcome variables. The failure to obtain these types of data can potentially result in an erroneous conclusion (Barnett et al., 1987; Cooke &

Poole, 1980). Data that may potentially impact on treatment are frequently included under the rubric of treatment verification (Cooke & Poole 1980). Examples of treatment verification variables include child attendance at the intervention program and parent attendance at the PIE sessions. Data collected in this study encompasses aspects of treatment verification as well as other potential impacts on treatment. These other potential impacts on treatment are referred to as contextual variables. Examples of contextual variables include outside events which may impact on families and intervention services obtained outside of the program under investigation.

This section will examine data obtained on treatment verification and contextual factor variables. For ease of presentation, these treatment verification and contextual factor variables will be referred to as potential impacts on treatment, except in subanalyses that examine a single measure or area.

One year of intervention. Possible impact data are presented in Table 8.5 for subjects receiving one year of intervention. Child attendance data for basic services and parent attendance data for parents' training sessions were recorded throughout the year. Child attendance was recorded daily, and parent attendance data (for the Center + PIE group) was recorded weekly; these data were sent to EIRI on a monthly basis. An initial analysis of attendance data indicates no difference in child attendance rates as a function of group placement (Table 8.5). Average attendance for all subjects was 88.2% of possible school days. Average attendance by parents at the training sessions was 47.6% of all PIE classes for all parents. Fifty-seven percent of parents attended between 5 and 11 classes; only 13% of parents (5 parents) attended more than 75% of the time. These absences occurred in spite of repeated attempts by program staff to encourage regular attendance. The local site coordinator regularly called absent parents to promote attendance. These data pertain only to PIE I and will need to be considered when conducting data analysis and discussing results.

Table 8.5

Potential Impact on Treatment Data for Subjects Receiving One Year of Intervention for Des Moines Study

	Center-Only			Center + PIE				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[♦]
• General health of child[&]	2.0	(0.5)	39	1.9	(0.7)	32	.66	-.20
• Percent child attendance	87.3	(7.9)	38	90.0	(6.6)	34	.13	.34
• Parent satisfaction[^]	24.9	(2.5)	29	25.1	(2.9)	26	.73	.08
• Teacher rating of parents[#]	5.3	(2.0)	40	7.0	(1.9)	34	.00	.85
• Parent PIE attendance	---	---	---	47.6	(22.0)	34	---	---
• Additional Services received[*] outside the intervention program								
Percent receiving outside[**] speech therapy	7.3		41	9.1		33	.79	.12
Percent receiving outside[**] motor therapy	7.3		41	6.1		33	.83	-.05

[&] Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[^] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28). Higher scores indicate greater satisfaction.

[#] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

[*] Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

[♦] $$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

[**] Statistical analyses for these variables were based on a t-test where those receiving services were scored "1" and those not receiving services "0." Effect sizes are based on a probit transformation of percentage data.

A description of quality of parent involvement was also gathered annually by a direct intervenor (teacher) who worked most closely with the respective parent. The data obtained was the intervenor's perception (low, average, high) of how a parent rated on attendance, knowledge, and support. These data are presented in Table 8.5. Teachers rated parents in the Center + PIE group as having a higher quality involvement with the school program. This occurred although teachers were not directly informed of child group placement (although information could have been shared by parent and teacher or indicated through other cues).

In addition to the intervenor's rating of parents, parents were asked to rate their satisfaction with the program (see Table 8.5). Parents rated the intervention program on seven questions that assess satisfaction in a variety of areas (e.g., staff, participation, communication, etc.). Parents in both groups were equally satisfied with the center-based program.

Health data on each child were also obtained. Data on hospitalizations (and length), days with fever, a general health rating of the child, and other factors were collected. Data on child general health are presented in Table 8.5. No differences between the study groups were found on any of the health measures.

Teachers in Des Moines were also evaluated annually by their immediate supervisor. These data are relevant to treatment verification. Teachers were rated by their supervisor either as being satisfactory or as needing training. The Des Moines School District uses only two rating levels as per an agreement with the local teachers' union, and no other evaluations can be conducted as per the contract. All teachers of subjects involved in this study received a satisfactory rating.

Additionally, information was obtained at posttest on the amount of time each child spends in various activities/therapies such as daycare, speech therapy, etc. outside of the intervention program. The data for the two most frequently occurring additional services are presented in Table 8.5. No group differences were found.

Two years of intervention. Potential impact on treatment data for subjects receiving two years of intervention (see Figure 8.1) are presented in Table 8.6. These data are presented by first and second year of intervention. Variables on which these data were obtained were discussed previously and will not be repeated. The groups were not significantly different on any of these variables in either year.

Parent satisfaction data obtained after the second year of intervention were different than those obtained earlier. Satisfaction questions focused on the parents involvement in, and understanding of, the child's educational program. This was done in an attempt to make the satisfaction questionnaire more sensitive to aspects of

Table 8.6

Potential Impact on Treatment Data for Subjects Receiving Two Years of Intervention Presented by First and Second Year of Intervention for the Des Moines Parent Involvement Study

	First Year								*Second Year*							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES[♦]
● General health of child[^]	1.9	0.5	15	1.8	0.8	18	.89	-.20	1.9	0.7	14	1.8	0.6	18	.69	-.14
● Percent child attendance	88.3	7.3	12	89.0	6.1	19	.77	.10	88.4	5.6	14	88.9	11.3	18	.89	.09
● Parent satisfaction[+]	25.0	2.2	14	24.9	3.1	19	.91	-.05	26.7	3.0	7	26.3	5.5	15	.84	-.13
● Teacher rating of parents[#]	6.4	1.9	14	7.2	1.9	19	.25	.42	7.1	1.7	14	8.0	1.4	16	.11	.53
● Additional services received[*] outside the intervention program																
Percent receiving[*] outside speech therapy	0.0		15	5.2		19	.71	.13	0.0		12	17.8		17	.28	.38
Percent receiving[*] outside PT/OT therapy	6.7		15	0.0		19	.72	-.25	0.0		12	0.0		17	---	.00

[^] Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[+] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28) in the first year. In the second year, satisfaction is based on the sum of eight questions that deal with aspects of satisfaction related to the parents participation in the child's educational program (range = 8 to 32). Higher scores indicate greater satisfaction.

[#] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

"---" = t-test not conducted because of no variance.

[♦] $$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

[**] Statistical analyses for these variables were based on a t-test where those receiving services were scored "1" and those not receiving services "0." Effect sizes are based on a probit transformation of percentage data.

parent involvement. The data presented in Table 8.6 indicate no group differences using this new questionnaire.

Average attendance at parent training sessions during the first year of intervention ranged from 2 to 13 of 16 possible PIE I sessions, with a mean of 7.8 sessions (SD = 3.0). During the second year, of 12 PIE II sessions, parents attended from 0 to 12 sessions with a mean of 4.6 sessions (SD = 4.4). Regular parent contacts were made to nonattending parents in an attempt to increase attendance.

The concern that the Center + PIE I + PIE II subgroup of the Center + PIE group might have been different from the other parents in the Center + PIE group that received only PIE I was a concern that arose in relation to attendance at parent meetings during the first year. A t-test between these two subgroups was completed on attendance at PIE I meetings, and no difference in attendance was found ($\underline{t} = 1.08$, $\underline{p} = .29$).

Site review. One source of treatment verification data is information from a site review conducted annually by the site coordinator. The first site review was conducted on April 10, 1987, and a second site review was conducted on May 10 and 11, 1988. The purposes of these reviews were to: (a) collect information about the nature and quality of early intervention services that were being delivered, (b) verify that the research being conducted by EIRI was being implemented as intended, and (c) collect assessment data that may have been useful to site administrators to guide internal changes and for use when seeking technical assistance.

Purposes (a) and (b) are of primary interest in this report. The Des Moines School District was conducting the research as intended by EIRI. Overall findings indicated that: the preschool program was of high quality; it was staffed by enthusiastic and qualified professionals; classroom environments were safe and appropriate; teachers emphasized functional skills in naturally occurring environments; the program was competently administered, used up-to-date curricula, and had proper evaluation, assessment, and progress procedures; parent training sessions were well organized and well facilitated; and parent participation was good. (For more information, a copy of the site reviews can be obtained.)

Family life events. Life events that occur to a family prior to, during, and after intervention are contextual factors that may also potentially impact on outcome data. To examine this possibility, the Family Inventory of Life Events and Changes (FILE) (McCubbin et al., 1983) was administered at Pretest and Posttest #1 and #2 (see Tables 8.11 and 8.12 for a description of this measure). This measure was discontinued after Posttest #2 based on parent request.

The data obtained from the FILE are presented in Table 8.7. These data do indicate that the families in the Center + PIE group were experiencing significantly more life events; a factor which may impact on treatment.

These results clearly indicate the differential occurrence of family life events. This finding was considered when conducting outcome analyses and the use of the FILE as a covariate was examined. The FILE did not correlate significantly with child outcome variables, nor with the majority of family functioning variables (see Results and Discussion section for more information).

Although the FILE was not administered at Posttest #3 or #4, the Holmes and Rahe Major Life Events Scale (Holmes & Rahe, 1967) (see Table 8.12 for a description of this measure) is being administered at Posttest #5 to gather additional information on longitudinal aspects of life events.

Table 8.7

Family Inventory of Life Events Scores* for Des Moines Parent Involvement Study

	Center-Only			Center + PIE			p Value
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	
Pretest	8.1	(4.8)	41	12.0	(8.0)	34	.02
Posttest #1	7.4	(5.3)	41	10.8	(6.9)	34	.02
Posttest #2	6.1	(5.0)	24	9.7	(7.4)	25	.05

* range = 0 to 71

Posttests #2, #3, and #4. Possible impact on treatment data for subjects after intervention had ended was less extensive than during intervention. Data collected at these posttests consisted of information regarding the child's health and information regarding services the child received outside of those provided by school placement. (Hours of outside services data were not available for Posttest #4.) These data were obtained from parent report at posttest. These data are presented in Table 8.8.

Table 8.8

Possible Impact on Treatment Data for Posttest #2, #3, and #4 for Des Moines Parent Involvement Study

	Posttest #2								Posttest #3								Posttest #4							
	Center Only			Center + PIE					Center Only			Center + PIE					Center Only			Center + PIE				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES[♣]	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES[♣]	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES[♣]
● General Health of Child[♦]	1.9	(0.6)	26	1.9	(0.5)	26	.66	.00	2.1	(0.5)	36	2.0	(0.7)	31	.45	-.20	2.1	(0.6)	34	2.1	(0.5)	32	.97	.00
● Therapies received[*] outside school program																								
Percent receiving[**] outside speech therapy	8.8		34	22.6		31	.13	.52	0		25	17.0		23	.00	.95	———			———			—	—
Percent receiving[**] outside PT/OT therapy	2.9		34	3.2		31	.95	.04	0		25	8.7		23	.04	.61	———			———			—	—

[♦] Based on a parent rating of the child's health were 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[*] Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

"______________" = no data available.

[♣] $$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center-Only)}}{\text{SD (Center-Only)}}$$

[**] Statistical analyses are based on t-tests where those receiving services were scored "1" and those not receiving services "0." ESs are based on a probit transformation of percentage data.

No differences were found between groups in the health of the subjects for any of the posttests on any of the health variables examined. In terms of extra therapies received by subjects, a difference occurs in the amount of speech therapy subjects received outside of school. Subjects in the Center + PIE group received more speech therapy as reported at Posttest #2 and #3. No differences between groups were found in motor therapies received at any posttest. These data suggest that Center + PIE subjects may have had a slight advantage over the Center-only subjects in communication skills because of extra speech therapy.

Test of parent knowledge. A treatment verification variable was a test of parent knowledge administered to parents at all posttests. The test of parent knowledge was designed as part of PIE I and assessed the degree to which parents learned the concepts taught in PIE I. The test consisted of 30 multiple choice questions and higher scores indicated greater retention of concepts.

Initial analyses (t-tests) of data from the test of parent knowledge indicated that parents in the Center + PIE group obtained statistically significantly higher scores than the Center-only group at all posttests. The test of parent knowledge results were reanalyzed to examine differences between parents who received intervention for one year (Center + PIE I) vs. two years (Center + PIE I + PIE II). Oneway analyses of variance were conducted between these two experimental subgroups and the control group. These data are presented in Table 8.9. Statistically significant differences were found at all posttests. A Student-Newman-Keuls procedure was conducted to determine specific group difference. The Center + PIE I + PIE II cohort performed better than the control group at all posttests. The Center + PIE I cohort performed better than the control group at Posttests #1 and #3. However, the center + PIE I + PIE II group performed better than the Center + PIE group at posttests #2 and #4.

These results suggest that the longer parents remained in intervention, the better their recall for concepts and information taught during PIE I, and that those

Table 8.9

Test of Parent Knowledge* Scores for Des Moines Parent Involvement Study

	Center Only			Center + PIE I			Center + PIE I + PIE II				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	Direction+	P Value
Posttest #1	8.6	(4.2)	41	13.9	(5.9)	15	17.2	(5.4)	19	0 < 1 0 < 2	.000
Posttest #2	10.1	(6.0)	35	12.7	(5.6)	14	17.3	(7.1)	18	0 < 2 1 < 2	.001
Posttest #3	9.1	(5.3)	37	14.2	(5.8)	13	17.9	(7.2)	18	0 < 1 0 < 2	.000
Posttest #4	10.0	(5.4)	36	12.7	(5.7)	14	17.3	(7.7)	18	0 < 2 1 < 2	.001

* Range = 0 to 30

+ Indicates direction of significance based on Scheffe procedure; 0 = Center-Only, 1 = Center + PIE, 2 = Center + PIE I + PIE II.

who received PIE intervention had more knowledge of the intervention subject matter than those who had not received the PIE intervention. This finding is consistent with the goals of the PIE intervention and suggests that the PIE intervention was effective in this aspect of knowledge provision. The fact that parents who received two years of PIE intervention recall more information than those only receiving one year of intervention is also consistent with expected intervention outcomes. Although PIE II was different in overall intent, it did provide parents with a forum to use information learned in PIE I.

Cost of Alternative Interventions

The cost of the basic center-based program and the center-based + PIE I and PIE II programs, as described above, was determined using the ingredients approach (Levin, 1983). Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, transportation, materials and supplies, and contributed resources. The cost of the center-based plus PIE I and center-based plus PIE II is simply equal to the cost of the basic center-based program available to 210 children (all center-based enrolled preschool children) plus the additional cost of PIE I or PIE II for those families who participated in 1987-88. The cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each program. Table 8.10 presents the cost per child in each of these resource categories. At the bottom of Table 8.10, costs are discounted at real rates of 3% and 5%. All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1991). Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had

Table 8.10

Cost Per Child for Des Moines Study

	Center-Based	Center-Based + P.I.E.		
Resource	Only	PIE I	PIE II	Average PIE
1. **UNDISCOUNTED**				
Agency Resources:				
Direct Service Personnel	$4,214	$5,749	$4,645	$5,197
Administrative Personnel				
Preschool	247	247	247	247
District	1,284	1,284	1,284	1,284
Facilities	224	224	224	224
Equipment	33	33	33	33
Materials/Supplies	40	85	54	70
Transportation				
Child	501	501	501	501
Staff	36	36	36	36
Subtotal	$6,579	$8,160	$7,024	$7,592
Contributed Resources:				
Parent Transportation	0	91	54	72
Parent Time	0	772	698	734
Total	***$6,579***	***$9,023***	***$7,776***	***$8,398***
2. **DISCOUNTED COSTS (3%)**				
Agency Resources	$7,189	$8,917	$7,675	$8,296
Total Resources	7,189	9,860	8,497	9,177
3. **DISCOUNTED COSTS (5%)**				
Agency Resources	$7,616	$ 9,446	$8,131	$8,789
Total Resources	7,616	10,445	9,002	9,722

the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to each program. Because the program is operated within a public school system, school and general direct administration were included. Occupancy charges included the annual rent for the facility in which the program was housed, all utilities, insurance, and maintenance costs. Equipment costs were based on estimates of the market replacement value of all classroom and office equipment, annualized to account for interest and depreciation. Staff transportation costs for job-related travel were based on actual mileage at $.21 per mile. The average cost per child for children in special education in the school district was used for child transportation costs. The cost for materials and supplies included the annual expense to the program for all consumable items.

Contributed resources included the value of parent time working at home with their children, attending training sessions, and the time and expense of driving to the sessions. Parents in the PIE I group spent an average of 16.5 hours and PIE II parents spent an average of 9.32 hours in training sessions, and, assuming that parents followed PIE curriculum requirements, 60 hours working at home with their child. In addition, parents in both groups were interviewed via telephone to determine their transportation expenses to attend sessions. These costs were assigned the opportunity cost of $9 per hour; mileage was assessed at $.21 per mile.

Data Collection

It is important to note that the data collected for this study were collected to assess the effects of intervention not only on the children, but also on their families. As noted earlier, pretest data and data from Posttest #s 1, 2, 3, 4, and 5 have been collected. The instruments used to obtain data on children and their families, and the posttest administration information on these instruments is presented in Table 8.11. A brief description of each of these instruments is presented in Table 8.12.

Table 8.11

Schedule of Administration and Tests Administered for Des Moines Parent Involvement Study

	Pretest	Posttest #1	Posttest #2	Posttest #3	Posttest #4	Posttest #5
CHILD MEASURES						
Battelle Developmental Inventory	X	X	X	X		
Woodcock-Johnson Tests of Achievement					X	X
Scales of Independent Behavior					X	X
Joseph Preschool and Primary Self-* Concept Inventory		X	X	X	X	
Stanford-Binet Intelligence Test** Form L-M		X				
Developmental SPECS					X	
Harter Perceived Self-Competence Inventory						X
Social Skills Rating System						X
FAMILY MEASURES						
Parent Stress Index	X	X	X	X	X	
Family Support Scale+	X	X	X		X	X
Family Resource Scale	X	X	X	X	X	X
Family Inventory of Life Events+ and Changes	X	X	X			
Family Adaptation and Cohesion Evaluation Scales	X	X	X	X	X	X
CES-D Depression Scale		X	X	X		
Child Improvement Questionnaire		X	X	X	X	X
Parent as a Teacher Scale*			X	X	X	
Comprehensive Evaluation of Family Functioning						X
Parent Self-Awareness Scale						X
Holmes and Rahe Major Life Events						X

* At Posttest #1, this test was administered to Cohort 2 subjects. This test was not included in the test battery until 1988.

** This test was administered at Posttest #1 to Cohort 1 subjects only. The costs for administering this test were very high and the information being generated did not substantially add to that which was being otherwise collected.

+ At Posttest #2, these were completed only for Cohort 1 subjects due to an error caused by the staggered testing of cohorts.

Table 8.12

Description of Tests Administered for Des Moines Parent Involvement Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Woodcock-Johnson Tests of Achievement (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of nine aspects of scholastic achievement: Letter-word Identification, Passage Comprehension, Calculation, Applied Problems, Dictation, Writing Samples, Science, Social Studies, and Humanities.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1984)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: motor skills, social and communication skills, personal living skills, and community living skills.
Joseph Preschool and Primary Self-Concept Screening Test (JSI) (Joseph, 1979)	Assesses the self-concept of children ages 3.6 to 9.11 years via responses to line drawings. It provides a global self-concept score.
Stanford-Binet Intelligence Test Form L-M (Terman & Merrill, 1973)	The Stanford-Binet is a norm-referenced measure of general intellectual ability.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: communication, sensorimotor, physical, self-regulation, cognition, and self-social.
Social Skills Rating Scale (SSRS) (Gresham & Elliott, 1990)	A norm-referenced measure of child social skills and school success. Ratings are obtained from the child's parent and teacher.
Harter Perceived Self-Competence Scale (Harter & Pikes, 1983)	A pictorial scale of perceived competence and social acceptance for young children that assesses four domains: cognitive competence, physical competence, peer acceptance, and maternal acceptance.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1986)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.

(continued)

Table 8.12 (continued)

Description of Tests Administered for Des Moines Parent Involvement Study

MEASURES	DESCRIPTION
CES-D Depression Scale (Radloff, 1977)	This scale is a short self-report test designed to measure depression-symptomatology on the general population.
Child Improvement Questionnaire (Devellis, et al., 1985)	The questionnaire has been adapted from the Child Improvement Locus of Control (CILC). The CILC assesses parental perceptions of factors that affect the progress of their developmentally impaired child. Factors assessed are: chance, efforts by professionals, the child's efforts, parent efforts, and divine intervention.
Parent as a Teacher Scale (PAAT) (Strom, 1984)	Assesses parent attitudes toward aspects of the parent-child interactive system. The PAAT responses are grouped into five areas: creativity, frustration, control, play, and teaching-learning.
Comprehensive Evaluation of Family Functioning (CEFF) (McLinden, 1989)	Assesses areas in which a family having a child with special needs may be affected. Areas assessed are: time demands, acceptance, coping, social relationships, financial demands, well-being, and sibling relationships.
Parent Self-Awareness Scale (PSAS) (Snyder, Weildreyer, Dunst, & Cooper, 1985)	Assesses parent perceptions of empowerment in the areas of decision making, obtaining information, and in interactions with self and others.
Holmes & Rahe Major Life Events (Holmes & Rahe, 1967)	Assesses parent stress resulting from major life events that occurred within the past year.

Recruitment, training, and monitoring of diagnosticians. Diagnosticians were doctoral candidates in the School Psychology program at Iowa State University and other professionals in the community (i.e., speech and language therapists). Their training involved approximately 4 hours of independent study and 8 hours of group training. Each examiner, after administering a minimum of three practice BDIs, was required to pass a quality-control test administration before they were permitted to test. Further, approximately 10% of each examiner's test administrations were "shadow scored" during each testing period. Interrater reliability data on the BDI reveal coefficients consistently above .90. All test protocols were also rescored by EIRI clerical staff and errors indicated. This rescoring has resulted in only minor errors being discovered, increasing confidence in the examiners. These examiners also administered the Peabody Picture Vocabulary Test (PPVT) to mothers. This was done concurrent with the posttest BDI administration. None of the examiners had any involvement with the Des Moines School District program, so the likelihood of their knowing to which group a child was assigned was remote.

All Stanford-Binets were administered by three trained doctoral candidates in the Psychology program at Utah State University. All Stanford-Binet examiners were uninformed about the subjects' group assignments. None of the Stanford-Binet examiners had any other involvement with EIRI or the Des Moines Public Schools, so the likelihood of their knowing group assignments was also remote. The Stanford-Binet was administered while the child was in his preschool classroom placement.

During the Spring 1988 posttesting, the Joseph Preschool and Primary Self-Concept Inventory (JSI) was added as a measure. BDI examiners were trained in the administration of the JSI. Two examiners administered all JSIs (in 1988) to children while they were in the classroom placement. In following years, the JSI was administered with the other child measures.

At Posttest #4, two BDI examiners were trained in the use of the Woodcock-Johnson Tests of Achievement and the Scales of Independent Behavior. Certification requirements for administering these tests was the same as those established for the BDI. The mean interrater reliability on these instruments for Posttest #4 was 97.9%.

Administration of family measures has varied. At pretest, Posttest #1, and for some subjects at Posttest #2 (see second posttesting below), the measures were administered to parents while in a group by the site liaison. Parents were not allowed to discuss these measures during the session (except for individual questions to the liaison) and parents were requested not to discuss this information with other parents. This method of administration was selected to help ensure that examiners remained "blind" to subject group placement.

For some subjects in Posttest #2, and for subsequent posttests, parents completed posttest information during and following the time child measures were being administered. Examiners were familiarized with procedures to be followed for the family measures and with the individual measures.

Pretest. The following procedures were completed at pretest. Parents of each child participating in the study completed an informed consent form and provided demographic information. In the first of two pretesting sessions, parents (usually the mother) completed the family measures. In a second pretesting session, which took place within 2 weeks of the first session, children were administered the Battelle Developmental Inventory (BDI). Parents were paid $20 after both pretesting sessions were completed.

First posttesting. At the first posttest, a similar course of events occurred. Family measures were administered in one session and child measures during another session (see Table 8.11). At this and all subsequent posttests, demographic information was updated and parents provided information relevant to treatment verification. At this posttest only, mothers were administered the Peabody Picture Vocabulary Test--Revised (Dunn & Dunn, 1981). Parents were paid for participating in posttest activities. Payment was provided at all subsequent posttests.

Second posttesting. At Posttest #2, events differed slightly depending on whether children were enrolled in the preschool intervention program or a school-age program. Children in the preschool intervention program were posttested in the same manner as Posttest #1. Parents and children in the school-age program were tested during a single session. This change from two to one session for posttest activities was the only different aspect of the process.

Third posttesting. At Posttest #3, all measures were administered using the single session format.

Fourth posttesting. The format for Posttest #4 activities was the same as that described for Posttest #3. At Posttest #4, the BDI was no longer used. The mean age for subjects at this posttest was 94 months. The BDI is inappropriate for children at this age level. A number of ceiling problems had been noted on the BDI at Posttest #3. Child measures were changed at this point for all subjects (see Tables 8.11 and 8.12). In addition, information was obtained from each child's teacher on classroom placement and the teacher's judgment of child skills (SPECS). Parent permission to contact teachers was obtained. Teachers were mailed forms to be completed with appropriate descriptive information. Teachers were remunerated for their participation. Cohort #2 subjects' teachers will not be contacted until October 1991. This delay was initiated at the request of the school district.

Fifth posttesting. Although the Woodcock-Johnson and SIB continue to be used, the JSI and SPECs have been replaced by the Harter and SSRS. These changes reflect the increasing ages of the children. The SSRS is completed by both the parent and teacher. Some changes in family measures have also occurred (see Tables 8.11 and 8.12). These changes result in no loss of information, but instead use new instruments to obtain equivalent information. These changes reflect study sensitivity to parental input, results from data obtained on earlier measures, and the increasing age of children.

Cross posttesting issues. Two assessment issues cut across Posttest #3 and #4. These cross issues are the result of the staggered initial start dates for students. The teacher data (described above) have been collected for Cohort #2 subjects at Posttest #3 as well as for Cohort #1 subjects at Posttest #4 (Summer '90). These data have been analyzed across posttests. Teacher follow-up forms were sent to 55 teachers, accounting for 71 children. Forty-eight teachers have returned information (86%). This represents information on 61 subjects. These teacher follow-up data consist of a teacher-completed SPECS on each child and a classroom placement form. By November 1991, a complete set of teacher data will be available for Posttest #4.

A second issue that crosses posttests is data related to parent-child interaction. These data were collected to address concerns regarding qualitative aspects of the parent-child system that may have changed. These data were collected on all children during posttesting in Summer 1990. These data have been analyzed across posttests. A videotape protocol was developed to record parent-child interactions. Examiners were trained in this protocol and recorded interactions as the final part of the posttesting session.

Results and Discussion

This section will present data from all posttests.

Comparability of Groups on Pretest Measures

Comparability of groups at pretest for each of the posttest sessions will be presented in this section. Analyses are reported separately for each posttest because of the change in number of subjects at each posttest time.

Based on available demographic data (presented earlier in Table 8.1), there was a slight advantage for those subjects whose parents were involved in the Center + PIE group. The Center + PIE group families were better educated, held higher SES occupations, and had a higher annual income.

Additional information on the comparability of groups is presented in Table 8.13. This table presents data from the core measures at pretest for the Center-Only and Center + PIE groups. On the BDI, there is a slight advantage in favor of the Center-Only group subjects in adaptive and motor domain areas ($p < .10$).

Of the family measures, significant differences were found between the groups only on the FSS. Scores from the Family Support Scale indicate that families in the Center + PIE group had more support. Although the families differed on this measure, their stress ratings (based on the PSI) were not different. Also, resources available to each family (FRS), and family adaptability and cohesion (FACES) by group were comparable. Current knowledge of family functioning makes it difficult to interpret the effect these different patterns have on subject or family functioning

Table 8.13

Comparability of Groups on Pretest Measures for Des Moines Parent Involvement Study

	Posttest #1								**Posttest #2**							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
● Battelle Developmental Inventory (BDI)[*]																
Personal/Social	108.4	(27.5)	42	106.3	(23.4)	34	.73	-.08	108.2	(29.0)	37	105.8	(23.5)	33	.70	-.08
Adaptive Behavior	72.0	(15.0)	42	65.1	(16.8)	34	.06	-.46	71.2	(15.7)	37	65.6	(16.9)	33	.15	-.36
Motor	102.4	(22.2)	42	92.5	(27.0)	34	.08	-.45	100.0	(22.3)	37	92.4	(27.4)	33	.20	-.34
Communication	52.9	(15.3)	42	50.3	(19.1)	34	.52	-.18	51.6	(15.2)	37	50.1	(19.3)	33	.72	-.10
Cognitive	43.2	(13.8)	42	43.0	(17.8)	34	.94	-.01	42.6	(14.6)	37	42.8	(18.0)	33	.95	.01
TOTAL	378.9	(82.6)	42	357.2	(93.1)	34	.29	-.26	373.7	(86.5)	37	356.7	(94.5)	33	.43	-.20
● Parenting Stress Index (PSI)[♦]																
Child Related (range 0 to 30)	118.9	(20.4)	41	117.4	(18.4)	34	.73	.07	118.8	(20.0)	36	117.9	(18.4)	33	.85	.05
Other Related (range 54 to 270)	131.3	(23.7)	41	131.6	(28.8)	34	.97	-.01	130.2	(22.1)	36	132.8	(28.3)	33	.68	-.12
TOTAL (range 101 to 505)	250.2	(40.1)	41	248.9	(43.3)	34	.89	.03	249.0	(37.5)	36	250.7	(42.7)	33	.86	-.05
● Family Adaptation and Cohesion Evaluation Scales (FACES)[♣]																
Adaptation (range 10 to 50)	21.7	(6.7)	41	21.9	(3.7)	34	.89	.03	22.0	(7.0)	36	22.0	(3.7)	33	.97	.00
Cohesion (range 10 to 50)	37.3	(7.0)	41	38.6	(5.2)	34	.38	.19	37.5	(7.2)	36	38.5	(5.2)	33	.50	.14
● Family Resource Scale[♠] (FRS) (range 30 to 150)	118.8	(14.8)	41	116.3	(19.5)	34	.52	-.17	119.7	(14.5)	36	116.3	(19.8)	33	.42	-.23
● Family Support Scale (FSS)[δ] Total Score (range 0 to 4)	1.8	(0.7)	40	2.2	(0.8)	33	.06	.57	1.9	(0.7)	35	2.2	(0.8)	32	.19	.43
● Peabody Picture Vocabulary[&] Test - Revised (PPVT)	83.3	(18.1)	40	92.3	(18.3)	34	.04	.50	83.2	(19.1)	35	93.6	(16.9)	33	.02	.54

(continued)

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales, and these are presented.

[♣] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

[♠] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[δ] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[&] Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

[^] $$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center only)}}{\text{SD (Center Only)}}$$ The sign of the ES is reversed for the PSI, as lower scores are preferred.

Table 8.13 (continued)

Comparability of Groups on Pretest Measures for Des Moines Parent Involvement Study

	Posttest #3								Posttest #4							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
● Battelle Developmental* Inventory (BDI)																
Personal/Social	108.4	(29.0)	37	106.5	(24.0)	31	.77	-.07	108.4	(29.0)	37	106.3	(23.4)	34	.74	-.07
Adaptive Behavior	71.6	(16.0)	37	65.7	(17.0)	31	.14	-.37	71.6	(16.0)	37	65.1	(16.8)	34	.10	-.41
Motor	100.7	(22.8)	37	92.0	(27.8)	31	.16	-.38	100.7	(22.8)	37	92.5	(27.0)	34	.17	-.36
Communication	52.1	(15.7)	37	50.7	(19.7)	31	.76	-.09	52.1	(15.7)	37	50.1	(19.0)	34	.67	-.13
Cognitive	42.7	(14.6)	37	43.5	(18.3)	31	.84	.05	42.7	(14.6)	37	43.0	(17.8)	34	.94	.02
TOTAL	375.5	(87.5)	37	358.5	(96.3)	31	.45	-.19	375.5	(87.5)	37	357.2	(93.1)	34	.40	-.00
● Parenting Stress Index (PSI)♦																
Child Related (range 0 to 30)	118.2	(20.7)	36	118.1	(18.7)	31	.98	.00	118.2	(20.7)	36	117.4	(18.4)	34	.86	.04
Other Related (range 54 to 270)	129.6	(23.0)	36	134.4	(28.0)	31	.44	-.21	129.6	(23.0)	36	131.6	(28.8)	34	.75	-.09
TOTAL (range 101 to 505)	247.8	(39.2)	36	252.5	(42.5)	31	.64	-.12	247.8	(39.2)	36	248.9	(43.3)	34	.91	-.03
● Family Adaptation and♣ Cohesion Evaluation Scales (FACES)																
Adaptation (range 10 to 50)	21.9	(7.0)	36	22.0	(3.8)	31	.92	.01	21.9	(7.0)	36	21.9	(3.7)	34	.98	.00
Cohesion (range 10 to 50)	37.5	(7.3)	36	38.2	(5.2)	31	.64	.10	37.5	(7.3)	36	38.6	(5.2)	34	.45	.15
● Family Resource Scale♠ (FRS) (range 30 to 150)	119.0	(14.1)	36	116.0	(19.5)	31	.47	-.21	119.0	(14.1)	36	116.3	(19.5)	34	.50	-.19
● Family Support Scale (FSS)§ Total Score (range 0 to 4)	1.9	(0.7)	35	2.2	(0.8)	30	.11	.43	1.9	(.7)	35	2.2	(.8)	33	.12	.43
● Peabody Picture Vocabulary& Test - Revised (PPVT)	82.6	(18.9)	35	93.7	(14.8)	31	.01	.59	82.6	(18.9)	35	92.3	(18.3)	34	.03	.51

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales, and these are presented.

[♣] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

[♠] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[§] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[&] Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

[^] $\text{ES} = \dfrac{\bar{x}\ (\text{Center + PIE}) - \bar{x}\ (\text{Center only})}{\text{SD (Center Only)}}$ The sign of the ES is reversed for the PSI, as lower scores are preferred.

as a result of intervention. However, because there is no correlation between the pretest scores on the FSS and measures of child functioning at posttest, these initial differences on the FSS are very unlikely to have biased child outcomes. FSS test scores, some demographic measures (e.g., mother education), and other family measures do correlate. Therefore, the FSS was considered as a potential covariate for later analyses.

Also included on Table 8.13 are scores from mother's performance on the Peabody Picture Vocabulary Test. This result is not an outcome variable, even though obtained at posttest. These data are related to the comparability of groups. A significant difference was found between mother's standard scores on this test, with mothers in the Center + PIE group demonstrating higher scores. Standard scores on this test are highly correlated with IQ scores. Mother's IQ has been hypothesized to be related to intervention success.

Overall, these results suggest that any group advantages at pretest favored the Center + PIE group on demographic and family functioning variables. However, child functioning variables favor the Center-Only group.

The pattern of results found for comparability of groups at Posttest #1 is essentially the same for Posttest #'s 2, 3, and 4 (see Tables 8.1 and 8.13). Although there are minor changes from one to another, the general pattern is one of comparability between the groups. What few differences do exist primarily favor the Center + PIE group on demographic variables. As noted earlier, variables where differences were discovered were considered in selecting covariates for the analysis of differences between groups at posttests. Thus, any bias related to those differences was likely to be adjusted as a result of using analysis of covariance.

Effects of Alternative Forms of Intervention

The following section will analyze the effects of the alternative forms of intervention on child and family functioning, and examine some site specific analyses.

Selection of covariates. The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. (Analyses other than analyses of covariance are described as such in the text and/or table.) Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance, and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis. All pretests and demographic variables and variables that could impact on treatment were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. According to Hopkins (1973) and Cohen (1977), in those cases where a covariate or set of covariates can be found which correlates with the dependent variable (which was almost always the case in these analyses), analysis of covariance can substantially increase power. In this study, with alpha set at $p \leq .10$, statistical power for finding a moderately sized difference (defined by Cohen as differences of a half a standard deviation) was approximately above 99% for child outcome measures and approximately 91% for the majority of family outcome variables. Power for the PAAT, CES-D, and Child Improvement Questionnaire was approximately 70%.

Measures of Child Functioning

Results of posttest data analysis on child functioning for Posttest #1, #2, and #3 are presented in Table 8.14, and for Posttest #4 in Table 8.15.

Posttest #1. After one year of intervention, results from the BDI show statistically significant differences ($\underline{p} < .10$) on the adaptive behavior and communication domains in favor of the Center + PIE group. Statistically significant differences were not found on other domains, nor on the Total BDI score. Statistically significant differences were not found on the Joseph Preschool and Primary Self-Concept Inventory (JSI) nor on the Stanford-Binet. These results suggest that the addition of this type of parent involvement program had some impact on measures of child development, but the impact was not consistent across the various domains measured. All but one of the effect sizes were positive, but it is unclear why there would be statistically significant differences for adaptive behavior and communication, but not for the other domains of the Battelle nor for the Stanford-Binet.

Posttest #2. Results from Posttest #2 are also presented in Table 8.14. Information on the Stanford-Binet is not included for this analysis since it was not administered after the 1986-87 academic year. As mentioned earlier, Posttest #2 analyses include subjects who "graduated" to school-age programs as well as those who received two consecutive years of intervention. No group differences were found on any of the BDI domains or total score. Results from the JSI also indicate no group differences (however, note the difference in the JSI sample between Posttests #1 and #2). Data indicate that any positive effects of the parent involvement were not maintained over time or may have been the result of sampling fluctuation. These data may have been effected by the implementation of the PIE II curriculum for some parents. These effects will be examined in analyses presented later in this report.

Posttest #3. Table 8.14 also includes child measure results from Posttest #3. No group differences were found on the BDI or JSI.

Table 8.14

Posttest Measures of Child Functioning for Posttest #1, #2, and #3 for Des Moines Parent Involvement Study

		Center Only				Center + PIE						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	P Value	ES^
POSTTEST #1												
Average length of intervention in program days	---	134.7	(29.0)		42	133.1	(31.8)		34	.05	.83	-.06
Age in months at posttest	---	59.9	(11.7)		42	59.3	(11.6)		34	.05	.82	-.05
Battelle developmental Inventory* (BDI)												
Personal/Social	20,1	118.2	(24.6)	115.3	42	116.1	(25.9)	118.9	34	.77	.38	.15
Adaptive Behavior	1,6,14	75.0	(15.0)	71.7	42	72.9	(20.9)	76.8	34	4.64	.04	.34
Motor	1	112.4	(23.4)	108.0	42	102.4	(28.6)	106.9	34	.09	.76	-.05
Communication	1	58.4	(16.0)	55.3	42	57.9	(21.1)	61.0	34	4.11	.05	.36
Cognitive	1	51.9	(16.4)	49.1	42	49.0	(17.9)	51.8	34	.95	.33	.16
TOTAL	1	415.9	(82.9)	398.5	42	398.4	(103.9)	415.7	34	2.37	.13	.21
Stanford-Binet+	1	75.6	(18.8)	73.3	28	72.1	(15.9)	74.4	19	.06	.81	.06
Joseph Preschool Primary* Self-Concept Inventory	2	19.5	(5.8)	19.2	11	20.9	(4.1)	21.2	7	1.57	.23	.34
POSTTEST #2												
Average length of intervention$ in program days	---	197.2	(82.1)		37	220.8	(77.4)		33	1.51	.22	.29
Age in months at posttest	---	70.9	(12.2)		37	71.6	(12.5)		33	.07	.80	.06
Battelle developmental Inventory* (BDI)												
Personal/Social	3	132.8	(25.4)	130.7	37	128.5	(32.6)	130.6	33	.00	.99	-.00
Adaptive Behavior	1,14	89.3	(18.0)	86.0	37	84.5	(20.1)	87.9	33	.59	.45	.11
Motor	2	120.9	(24.8)	116.8	37	111.6	(32.9)	115.7	33	.15	.70	-.04
Communication	16	68.0	(18.9)	67.2	37	66.6	(23.2)	67.3	33	.00	.96	.01
Cognitive	17,12	65.7	(23.0)	64.5	37	64.9	(25.4)	66.1	33	.31	.58	.07
TOTAL	3,12	476.7	(97.7)	463.8	37	456.1	(124.5)	469.0	33	.18	.68	.05
Joseph Preschool Primary* Self-Concept Inventory	3	22.2	(6.4)	22.1	32	23.7	(4.3)	23.8	29	1.87	.18	.27
POSTTEST #3												
Age in months at posttest	---	83.8	(12.1)		37	83.7	(11.7)		31	.00	.98	.01
Battelle developmental Inventory* (BDI)												
Personal/Social	3,25	146.4	(17.2)	144.6	37	143.8	(27.7)	145.6	31	.07	.79	.06
Adaptive Behavior	1	97.5	(15.5)	94.9	37	94.3	(21.3)	97.0	31	.55	.46	.14
Motor	2,25	130.4	(23.1)	125.6	37	121.7	(33.1)	126.4	31	.08	.78	.03
Communication	16	77.7	(20.9)	77.0	37	76.1	(25.2)	76.8	31	.00	.94	-.01
Cognitive	17	75.0	(22.8)	75.5	37	73.3	(25.8)	72.8	31	.67	.42	-.12
TOTAL	3,25	526.9	(88.9)	517.4	37	509.1	(125.0)	518.5	31	.01	.93	.01
Joseph Preschool Primary* Self-Concept Inventory	---	23.3	(4.4)	23.3	31	25.0	(3.5)	25.0	24	2.35	.13	.39

---

* Statistical analysis for BDI and JSI were conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center Only Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

♦ Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 7 = FACES Total; 8 = FACES Discrepancy; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child

+ Statistical analysis for the Stanford-Binet were conducted using IQ scores.

$ Data represents days in center-based preschool program combined across Posttest #1 and #2.

__Posttest #4__. Results from Posttest #4 are presented in Table 8.15. The child measures used at this posttest represent an entirely different instrument battery. However, the results are consistent with the findings of Posttests #2 and #3. No statistically significant differences were found between groups on the Woodcock-Johnson Tests of Achievement, on the Scales of Independent Behavior, nor on the JSI.

Table 8.15

Posttest #4 Measures of Child Functioning for the Des Moines Parent Involvement Study

		Center Only				Center + PIE						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	P Value	ES^
Age in months at posttest	---	96.3	(12.7)	---	37	97.0	(11.8)	---	34	.06	.80	.06
Woodcock-Johnson Test of Achiev.*												
Broad Knowledge	3	46.2	(13.0)	45.1	37	44.7	(16.8)	45.8	34	.11	.74	.05
Skills	17	45.0	(24.1)	45.2	37	44.7	(24.9)	44.5	34	.03	.86	-.03
Scales of Independent Beh.*												
Motor Skills	2	69.6	(13.2)	67.4	37	66.6	(19.4)	68.9	34	.54	.46	.11
Social/Communication	3	87.1	(11.8)	85.9	37	85.7	(17.4)	86.8	34	.16	.69	.08
Personal Living	2,12	135.2	(28.2)	128.9	37	128.4	(39.6)	134.7	34	1.56	.22	.21
Community Living	3,6,10	52.4	(24.0)	50.4	37	53.6	(24.5)	55.6	34	1.83	.18	.22
Broad Independence	2,12	344.4	(69.7)	331.1	37	334.4	(95.9)	347.6	34	2.06	.16	.24
Joseph Total*	26	24.8	(5.0)	24.8	30	25.0	(3.6)	25.1	27	.06	.82	.06
Teacher SPECS⁺												
Communication	1	6.6	(1.7)	6.4	20	7.0	(1.6)	7.1	22	1.93	.17	.41
Sensory Motor	1	16.9	(2.3)	16.6	20	16.7	(2.6)	17.1	22	.40	.53	.22
Physical	1	12.6	(1.9)	12.4	20	12.8	(1.9)	13.0	21	1.01	.32	.32
Self Regulation	1	14.5	(3.4)	14.2	20	15.1	(3.0)	15.3	22	1.25	.27	.32
Cognition	1	6.3	(2.4)	6.0	20	6.9	(1.8)	7.2	22	3.87	.06	.50
Self-Social	1	13.9	(3.6)	13.2	20	14.6	(3.0)	15.2	22	5.32	.03	.56

* Statistical analysis for BDI, SIB, and JSI were conducted using raw scores for each of the scales and these are presented (weighted raw scores on the SIB).

^ $$\text{ES} = \frac{\text{Adj.}\bar{x}\ (\text{Center + PIE}) - \text{Adj.}\bar{x}\ (\text{Center-Only})}{\text{SD (Center-Only)}}$$

♦ Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child

⁺ The SPECS were completed by each child's teacher. The raw scores possible for each domain are: Communication, 2 to 10; sensory motor, 4 to 20; Physical, 3 to 15; self-regulation, 4 to 20; Cognition, 1 to 10; and self/social, 4 to 20. Higher scores are preferred. These data will not be available for Cohort #2 until November 1991.

Also included on Table 8.15 are the teacher completed SPECS. Four of the six scales assessed by this measure show no difference between the groups (sensory-motor, physical, communication, and self-regulation). Of the two other scales, the results from the cognition and self-control scales indicate a difference between groups in favor of the Center + PIE group. Further confirmation of these results is necessary. The data presented are on Cohort #1 only and results from Cohort #2 may influence the results. Cohort #2's data will not be available until November 1991. Another indication of the strength of this result will occur on the cross posttest analyses of these data (to be presented).

Measures of Family Functioning

Table 8.16 presents data on parent and family functioning for Posttests #1, #2, #3, and #4.

Posttest #1. Families in the Center + PIE group were found to have more sources of support available to them based on scores from the Family Support Scale. It is possible that the support component of the PIE influenced actual or perceptions of support which lead to this finding. A significant difference was also found on the CES-D. Mothers in the Center + PIE group reported less depression symptomatology. This finding could be associated with increased support perceived by these mothers.

A differences was found on one subscale of the Child Improvement Questionnaire (CIQ) which assesses locus of control perceptions. The CIQ was designed to measure parental beliefs concerning control over the improvement of children who are physically, emotionally, or developmentally impaired. A significant difference was found on the chance subscale. The subscale assesses parental beliefs that their child's improvement is largely a matter of fate or of factors beyond their control. Parents of children in the Center + PIE group were significantly less likely to believe their child's progress was due to fate. A change away from believing fate is controlling child improvement is a change that may be associated with PIE. One goal of the PIE was to help the parents improve their intervention skills to increase the perceptions of themselves as a factor in their child's improvement. Therefore, change in the parent subscale of the CIQ was expected, but did not occur. This

Table 8.16

Posttest Measures of Family Functioning for Des Moines Study

		Posttest #1													Posttest #2													
		Center Only					Center + PIE								Center Only					Center + PIE								
Variable	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	P Value	ES^	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	P Value	ES^
Parent Stress Index (PSI)#																											
Child Related	5	118.2	(21.7)	117.3	86	41	112.8	(16.5)	113.7	80	34	1.32	.25	.17	119.0	(20.7)	118.8	88	35	118.5	(17.0)	118.6	88	32	.00	.96	.01
Other Related	6	134.5	(24.1)	134.2	72	41	129.6	(26.2)	129.9	66	34	1.85	.18	.18	129.2	(20.1)	130.4	66	35	133.2	(28.0)	131.9	70	32	.14	.71	-.07
TOTAL	4	252.7	(39.8)	251.4	81	41	242.4	(38.1)	243.6	75	34	2.32	.13	.20	248.2	(35.5)	249.2	79	35	251.6	(39.6)	250.6	81	32	.05	.82	-.04
Family Support Scale (FSS)**																											
TOTAL	9,10	1.5	(.8)	1.6		39	2.1	(.6)	2.0		34	8.34	.01	.50	1.7	(.8)	1.8		23	2.1	(.9)	2.0		24	.60	.44	.25
Family Resource Scale (FRS)♦																											
TOTAL	10,9,11	121.5	(17.0)	119.8	54	41	117.7	(18.9)	119.4	51	34	.02	.89	-.02	125.8	(14.6)	123.0	59	35	114.4	(24.8)	117.1	48	33	2.46	.12	-.40
Family Adaptation* Cohesion Eval. (FACES)																											
Adaptation	19	21.4	(6.7)	21.5		40	20.8	(4.9)	20.7		33	.45	.51	-.09	21.2	(5.4)	21.2		34	20.3	(5.2)	20.3		32	.56	.46	-.17
Cohesion	6,20	38.0	(7.0)	38.4		40	38.1	(6.0)	37.7		33	.30	.59	.01	36.6	(7.2)	36.9		34	36.9	(6.9)	36.6		32	.04	.85	.04
Child Improvement## (Locus of Control)																											
Professional	**18**	18.7	(2.8)	18.9		41	19.9	(4.3)	19.6		34	.74	.39	.25	19.9	(4.5)	19.9		36	19.3	(3.8)	19.3		32	.46	.50	-.13
Divine Intervention	**14,12**,23	12.5	(3.3)	12.1		41	11.4	(3.5)	11.9		34	.09	.76	-.06	11.5	(3.4)	11.2		36	11.6	(3.6)	11.8		32	.38	.54	.18
Parent		23.4	(2.5)	23.4		41	23.9	(3.1)	23.9		34	.66	.42	.20	23.8	(2.8)	23.8		36	23.9	(3.2)	23.9		32	.02	.89	.04
Child	**5,12**,13	21.3	(3.0)	21.0		41	19.8	(4.2)	20.1		34	1.20	.28	-.30	21.9	(4.0)	21.5		36	19.4	(3.8)	19.8		32	3.76	.06	-.43
Chance	**13**,12	11.6	(3.7)	11.2		41	9.3	(3.1)	9.7		34	3.75	.06	-.41	12.7	(4.6)	12.0		36	9.7	(3.2)	10.4		32	3.76	.06	-.35
CES-D Depression#	6	31.6	(9.0)	31.5		41	28.4	(8.6)	28.4		34	2.88	.09	.34	29.1	(6.7)	29.4		36	33.8	(12.0)	33.5		33	4.37	.04	-.61
Parent as a Teacher♦ Scale (PAAT)																											
Creativity	5														26.7	(1.6)	26.7		34	27.0	(2.7)	27.0		32	.30	.58	.19
Frustration	3,4														27.0	(2.1)	27.1		34	26.7	(3.1)	26.6		32	.63	.43	-.24
Control															25.7	(2.7)	25.7		34	27.0	(2.6)	27.0		32	3.76	.06	.48
Play	4														28.9	(2.5)	28.8		34	29.3	(2.9)	29.3		32	.65	.42	.20
Teaching/Learning	5														28.7	(2.7)	28.7		34	29.7	(3.0)	29.7		32	2.59	.11	.37
TOTAL	4														137.0	(8.3)	137.8		34	139.7	(11.5)	138.9		32	.25	.62	.33

(continued)

^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center Only Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI and CES-D, the numerator for the ES is reversed, as lower scores are preferred.

Statistical analysis for the PSI and CES-D were based on raw scores where low raw scores are most desirable.

* Scores for each subscale of the FACES are derived from linier scoring where higher scores are preferred.

♦ Statistical analyses for the FRS and PAAT were based on raw scores where higher scores are preferred.

** Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

* Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child; 31 = FSS sources of support. Covariate numbers in standard type were used for both Posttest #1 and #2, **bold** numbers were used for Posttest #1 only, underlined numbers were used for Posttest #2 only.

On the Child Improvement Questionnaire, ESs are used only to indicate direction of result. See text for interpretation of findings. Statistical analyses are based on raw scores.

Table 8.16 (continued)

Posttest Measures of Family Functioning for Des Moines Study

		Posttest #3														Posttest #4												
		Center Only					Center + PIE								Center Only					Center + PIE							
Variable	Covariates*	$\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	ANCOVA F	P Value	ES^	$\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	%ile	n	ANCOVA F	P Value	ES^
Parent Stress Index (PSI)#																											
Child Related	5,31	116.0	(18.5)	116.0	80	37	112.5	(22.4)	112.6	80	31	.63	.43	.02	116.0	(20.6)	114.7	80	36	110.4	(19.6)	111.6	77	32	.63	.43	-.27
Other Related	**3**,13,6,31	129.8	(21.0)	130.7	68	37	130.3	(27.1)	129.4	65	31	.11	.74	.06	127.7	(27.5)	127.6	61	36	126.1	(24.9)	126.1	60	32	.12	.74	-.06
TOTAL	4,31	245.8	(34.4)	247.3	78	37	242.8	(45.2)	241.3	72	31	.64	.43	.17	243.7	(46.0)	242.2	72	36	236.4	(39.2)	237.9	69	32	.32	.57	-.16
Family Support Scale (FSS)♦♦																											
TOTAL	9,20														1.9	(.8)	2.0		32	1.8	(.8)	1.8		30	1.60	.21	-.25
Family Resource Scale (FRS)♦																											
TOTAL	10,13	122.7	(12.8)	121.6	57	37	120.3	(23.9)	121.5	57	31	.00	.98	-.01	125.5	(14.4)	124.2	61	31	119.0	(22.8)	120.2	54	32	1.86	.18	-.28
Family Adaptation° Cohesion Eval. (FACES)																											
Adaptation	19	21.8	(5.7)	21.8		36	21.6	(5.1)	21.6		31	.04	.85	-.04	21.1	(5.3)	21.1		35	22.1	(4.4)	22.2		32	.90	.35	.21
Cohesion	20,**6**,4,10	37.5	(6.7)	37.6		36	38.6	(5.2)	38.5		31	.65	.42	.16	37.5	(6.9)	37.8		35	38.7	(6.4)	38.5		32	.29	.59	.10
Child Improvement## (Locus of Control)																											
Professional	17	18.3	(4.2)	18.3		37	18.8	(4.2)	18.8		31	.24	.63	.12	19.4	(4.2)	19.4		36	18.3	(4.1)	18.3		32	1.21	.28	-.26
Divine Intervention	14,**27**	12.3	(3.6)	12.4		37	11.9	(3.6)	11.8		31	.55	.46	-.17	12.0	(3.2)	11.7		36	11.4	(3.7)	11.7		32	.01	.94	-.19
Parent	**25**,**28**,31	22.3	(3.9)	22.4		37	24.0	(2.8)	23.9		31	3.52	.07	.38	23.3	(3.9)	23.2		36	23.3	(4.2)	23.4		32	.06	.81	.00
Child	**18**,12	21.4	(3.0)	20.9		37	21.0	(3.9)	21.5		31	.42	.52	.20	22.2	(2.6)	21.6		36	19.9	(5.7)	20.5		32	1.12	.29	-.88
Chance	13,20,19,**23**,**14**,	12.1	(4.1)	11.6		37	9.5	(3.0)	10.0		31	4.47	.04	-.39	11.6	(3.7)	11.1		36	10.2	(4.2)	10.7		32	.22	.64	-.38
CES-D Depression#	**6**,**12**	31.3	(9.4)	30.8		37	30.3	(8.4)	30.8		30	.00	.99	.00													
Parent as a Teacher♦ Scale (PAAT)																											
Creativity	**6**,9,**19**,5	26.8	(1.8)	26.6		33	26.6	(2.0)	26.8		30	.18	.67	.11	26.3	(2.5)	26.4		36	26.3	(2.0)	26.2		32	.16	.69	.00
Frustration	**6**,4,10	27.0	(1.9)	27.0		33	27.2	(2.6)	27.3		30	.36	.55	.16	27.7	(2.7)	27.7		36	26.7	(1.5)	26.7		32	4.07	.05	-.37
Control	**9**,7,1,13,20	25.3	(2.8)	25.8		33	27.5	(2.5)	27.0		30	3.36	.07	.43	25.2	(2.4)	25.5		36	26.6	(2.2)	26.2		32	1.68	.20	.58
Play	**6**,1,4,12	29.2	(2.6)	29.1		33	29.8	(2.6)	29.9		30	1.75	.19	.31	29.0	(2.4)	29.2		36	28.9	(2.0)	28.7		32	1.06	.31	-.04
Teaching/Learning	**6**,9,12	28.9	(2.8)	29.1		33	29.6	(2.6)	29.5		30	.29	.59	.14	29.1	(3.6)	29.5		36	29.2	(2.8)	28.8		32	.90	.35	.03
TOTAL	9,13	137.2	(8.4)	137.2		33	140.8	(9.0)	140.8		30	2.72	.10	.43	137.3	(10.1)	138.3		36	137.6	(7.1)	136.6		32	.79	.38	.03

^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center-Only Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI and CES-D, the numerator for the ES is reversed, as lower scores are preferred.

Statistical analysis for the PSI and CES-D were based on raw scores where low raw scores are most desirable.

° Scores for each subscale of the FACES are derived from linier scoring where higher scores are preferred.

♦ Statistical analyses for the FRS and PAAT were based on raw scores where higher scores are preferred.

♦♦ Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

* Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child; 31 = FSS sources of support. Covariate numbers in standard type were used for both Posttest #1 and #2, **bold** numbers were used for Posttest #3 only, underlined numbers were used for Posttest #4 only.

On the Child Improvement Questionnaire, ESs are used only to indicate direction of result. See text for interpretation of findings. Statistical analyses are based on raw scores.

failure to find a difference decreases confidence in the parent empowerment aspects of the PIE.

In addition to the analyses reported in Table 8.16, the subscales of the PSI were analyzed. Some caution is suggested when making interpretations based on these results, as the PSI authors recommend against using the subscales for interpretive purposes. These subscales were analyzed here for exploratory purposes. On the subscales, a significant difference was found in parents' stress regarding their sense of competence, with those parents in the Center + PIE group viewing themselves as more competent (less stressed). No differences were found on the 12 other subscales that compare the PSI.

The results from measures of family functioning should be interpreted conservatively. The majority of comparisons (i.e., PSI, FRS, FACES) show no differences between groups. The results of the FSS may be a treatment verification variable indicating that support was indeed provided as part of the PIE. It is also possible that in conducting as many analyses as were done here that findings of significance may occur, even when groups are comparable. The overall effects of adding this type of parent involvement group to an existing center-based early intervention program are quite small, if they exist at all. There is some evidence that mothers in the parent involvement group are less depressed, that they are less likely to attribute their child's condition to chance, and that they report more sources of support. However, on a wide range of other measures of family functioning, there were no statistically significant differences.

Posttest #2. Statistically significant differences were found on the child and chance subscales of the Child Improvement Questionnaire. The finding on the chance subscale repeats that found at Posttest #1. Center + PIE families were significantly less likely to believe their child's progress was due to fate. Center + PIE parents also attributed less of their child's progress to their child (i.e., within child attributions). Both of these differences could be attributed to the parent involvement component.

A significant difference was again found on the CES-D, but this time favoring the Center-Only group. This finding is the reverse of what occurred at Posttest #1. A significant difference was found on the PAAT control subscale. This difference suggested that Center + PIE parents were exerting more control over their children in teaching situations. Different hypothetical viewpoints exist as to the advantages or disadvantages of parental directiveness (cf., Blasco, Hancir, Blasco, 1990; Mahoney & Powell, 1988).

Overall, the results from family measures suggest that the only clear place the parent involvement may have affected families in on their attributions of progress in their child and on their directiveness in teaching situations. Other impacts seem negligible. Once again, it should be noted that some children and parents continued in intervention at this posttest, while others did not. This effect of this will be examined in later analyses.

Posttest #3. Results from this posttest are presented in Table 8.16. Differences between the groups occurred on the parent and chance scales of the CIQ, and on the control scale and total score of the PAAT. The results from the CIQ suggest that parents in the Center + PIE group view themselves as being an agent of change in their child's progress. This is a desired outcome of the parent involvement. Also, the finding that parents in the Center + PIE group are less likely to attribute their child's progress to chance is consistent with earlier posttests. The result from the PAAT suggest that the parents of children in the Center + PIE group exert more control over their child during teaching interactions (which replicates Posttest #2 findings) and engage, overall, in more positive teaching interactions with their child. This result is also positive toward the parent involvement component. Although there appear to be some small and limited benefits for this type of parent involvement program when added to a center-based program, the overall impact of the parent involvement component on a broad array of family functioning measures is negligible.

Posttest #4. Table 8.16 presents results from this posttest. Only one difference between groups was found at this posttest. Parents of children in the Center-Only group reported more frustration in learning situations on the PAAT. Posttest #4 results, overall, show no group differences. Even the positive attributions of child progress of the Center + PIE group have faded at this posttest.

Parent/Child Interaction

It was possible that the alternative forms of intervention may have affected parent/child interactions in a way that was not detected by the family measures. Preliminary results from other EIRI studies provided evidence which suggested parent/child interactions may have been impacted by the parent involvement component. To determine if the alternative interventions had an effect on parent/child interactions, these interactions were assessed during the posttesting that occurred in 1990.

All children who were posttested in 1990, and had parents who consented, were videotaped in a structured parent/child interaction situation. These children included subjects in Cohort #1 and #2. Therefore, some subjects were being tested for Posttest #3 and others for Posttest #4. The parent (typically mothers) and child were videotaped using a structured videotape protocol. Videotapes were scored using the Parental Behavior Rating Scale (Mahoney, Finger, & Powell, 1985) by observers trained and supervised by the scale developer, Gerald Mahoney.

The Parental Behavior Rating Scale assesses 12 factors that relate to parent/child interaction: expressiveness, enjoyment, warmth, sensitivity to child's interest, responsivity, achievement orientation, inventiveness, verbal praise, effectiveness, pace, acceptance, and directiveness. (Definitions of these factors can be obtained by writing EIRI or Dr. Mahoney.) Each factor is scored from 1 to 5, with 5 indicating greater amounts of the factor being measured. These 12 factors were divided into 3 major aspects (encompassing 10 factors) of parent/child interaction based on a factor analysis. These three aspects are:

1. ***Affect*** combines the scores from expressiveness, enjoyment, warmth, and acceptance. Affect assesses aspects of parent enjoyment with and emotional responses toward the child.
2. ***Reciprocation*** combines scores from the sensitivity to child's interest, responsivity, and effectiveness factors. Reciprocation assesses aspects of the parent's responsiveness to child initiations and parent ability to maintain engagement in interactions.
3. ***Control*** combines scores from achievement orientation, pace, and directiveness. This aspect assesses areas related to the parent's control of the interaction.

An analysis of covariance was conducted on scores from each of the 12 factors and from the 3 major aspects. Covariates were selected in the manner described earlier. No significant differences were found between groups on individual factors or major aspects. The results for the three major aspects are presented in Table 8.17. These results indicate that aspects of parent/child interaction as assessed by this observational instrument were not impacted by the parent involvement component.

Table 8.17

Measures of Parent/Child Interaction for Des Moines Parent Involvement Study

		Center-Only				Center + PIE						
Variable	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES^
Chronological age at taping (months)	--	91.3	(13.0)		33	92.3	(12.0)		30	.22	.64	.08
Affect (range 4 to 20)	1	10.7	(2.8	10.7	33	11.6	(2.5)	11.6	30	1.93	.17	.32
Reciprocation (range 3 to 15)	1	8.7	(2.3)	8.6	33	9.3	(2.5)	9.3	30	1.14	.29	.26
Control (range 3 to 15)	1	6.6	(2.2)	6.6	33	6.9	(2.0)	6.9	30	.35	.56	.14

* 1 = CA at taping

^ $ES = \frac{\text{Adj.}\bar{x}\text{ (Center + PIE)} - \text{Adj.}\bar{x}\text{ (Center-Only)}}{\text{SD (Center-Only)}}$

Classroom Follow-Up

It is possible that the effects of this type of parent involvement component may not become apparent until the child is in elementary school. To assess this, teachers of children in the study were contacted at the end of the 1989/90 school year for child information. Teachers were asked to complete a questionnaire on the child and the child's classroom placement. Information was requested on the teacher's perception of the child's parents, as well as some teacher specific and general classroom information. Teachers were also requested to complete a SPECS on the child.

Teachers were not informed of the specific purpose of the research or given any information that the child had been in an early intervention program for children with disabilities. Teachers who received these questionnaires had been identified by the parent as the child's teacher when permission to contact teachers was obtained. Fifty-five teachers, representing 71 subjects, were contacted; 48 returned information, representing 61 subjects. Of these 61 subjects, 43 were Cohort #1 subjects and 18 were Cohort #2 subjects. Not all teachers returned both questionnaires; information for 60 children is available on the questionnaire and for 55 children on the SPECS.

Information obtained from these teachers is presented in Tables 8.18 and 8.19. Table 8.18 presents descriptive information, by number of children, on grade placement, type of mainstreaming that occurs, and primary classroom placement. The majority of children are in self-contained, special education placements. The grade these children are in varies from preschool to second grade. A large group of children (46%) are in mixed grade self-contained classrooms. Of those children who are not in a typical placement, a variety of mainstreaming options were found.

Table 8.18

Descriptive Information on School Placement by Numbers of Subjects for Des Moines Parent Involvement Study

	Center-Only (n = 29)	Center + PIE (n = 31)
GRADE		
Preschool/Kindergarten^	7	6
1st	4	7
2nd	5	3
Mixed Grade*	13	14
MAINSTREAMED#		
Not Mainstreamed	8	7
Academic Mainstreaming+	1	4
Nonacademic Mainstreaming	9	7
All day Mainstreaming	3	3
PRIMARY PLACEMENT		
Typical Class	1	6
Typical Class + Resource	7	4
Self-Contained Class	21	21

* All mixed grade were in self-contained placements

+ Includes academic and nonacademic mainstream placements, as long as subject is mainstreamed for some academic subjects.

^ Child may remain in a preschool placement through age six.

# Only includes children who are not in a typical class placement.

Table 8.19

Teacher Reported Data for Des Moines Parent Involvement Study

		Center-Only			Center + PIE				
Variables	Covariates*	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Chronological age of child in months on 6/1/90		92.3	(14.5)	29	94.6	(12.2)	32	.50	.16
• Child Variables♦									
Percent in self-contained♣ placement		72.4		29	67.7		31	.70	.12
Percent in typical classroom placement without related services		3.5		29	19.4		31	.05	.72
Percent with special♣ education classification		93.1		29	83.9		31	.27	.39
Percent receiving special♣ service therapies		79.3		29	71.0		31	.46	.24
Percent anticipated for♣ special education placement in following year		62.1		29	44.5		29	.20	.41
• Ratings of Parents♠									
Attendance		2.3	(.8)	28	2.6	(.7)	31	.06	.38
Knowledge		2.0	(.8)	28	2.3	(.7)	31	.08	.38
Cooperation		2.2	(.7)	28	2.5	(.8)	31	.17	.43
• SPEC$^{\delta}$									
Sensorimotor	5	16.4	(2.5)	27	16.9	(2.6)	31	.28	.20
Physical	1	12.7	(1.7)	27	12.9	(1.9)	30	.49	.12
Self-regulation	1	14.7	(3.0)	27	15.1	(3.1)	31	.49	.13
Cognition	2	6.1	(2.2)	27	6.9	(1.7)	31	.23	.36
Self/Social	3	14.1	(3.3)	27	14.7	(3.2)	31	.54	.18
Communication	4	6.5	(1.6)	27	6.9	(1.4)	31	.35	.25

* Covariates: 1 = BDI adaptive, 2 = BDI cognitive, 3 = BDI total, 4 = BDI communication, 5 = BDI Motor

♦ Statistical analyses for these variables were based on a t-test where subjects possessing the trait were scored "1" and those not possessing the trait were scored "0." ESs for these variables are based on a probit transformation.

♠ Parent ratings are scored from 1 to 3, where higher scores are preferred. Results are from t-tests.

δ SPECS results are from analyses of covariance on the raw scores. Possible raw scores for the domains are: sensorimotor, 4 to 20; physical, 3 to 15; self-regulation, 4 to 20; cognition, 2 to 10; self-social, 4 to 20; and communication, 2 to 10. Higher scores are preferred. Adjusted means are presented in the table.

^ $$\text{ES} = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center-Only)}}{\text{SD (Center-Only)}}$$

♣ The sign of the effect size for these variables was reversed as lower percentages are preferred.

Comparative information on child-classroom placement variables are presented in Table 8.19. No significant differences were found on any of the variables examined except for percent in a typical classroom placement without special services. Significantly more subjects in the Center + PIE group are in a typical placement. Overall, the majority of children remain classified in special education and receive some related services. There is a trend for subjects in the Center + PIE group toward more preferred outcomes based on the finding of all positive effect sizes. However, the failure to find statistically significant differences requires that longitudinal findings be obtained to confirm or refute this trend.

Teachers were also asked to rate parents in three areas (attendance, knowledge, and cooperation) based on their interactions with the parents. A statistically significant difference was found on teacher ratings of parent attendance and knowledge (i.e., at PTA meetings, IEP meetings, parent-teacher conferences, familiarity with IEP process, etc.) in favor of the Center + PIE group (Table 8.19). No other significant differences were found.

Results from the teacher-completed SPECS are presented in Table 8.19. These data and results are different from those presented in Table 8.15, as these results combine subjects at Posttests #3 and #4. No significant differences were found on any of the SPECS domains in this analysis. These results suggest that the earlier significant results from the SPECS be cautiously interpreted until all Posttest #4 teacher data are collected.

Analysis of One Year vs. Two Years of Intervention

In the analyses presented earlier for Posttests #2, #3, and #4, the existence of a possible confound was mentioned. This possible confound is that the Center + PIE group consists of subjects who received two years of parent involvement intervention and subjects who received one year of parent involvement intervention.

The analyses reported in this section was conducted to determine the effects of these different durations of parent involvement on the data collected.

A oneway analysis of covariance was conducted on all child and family outcome measures, reported earlier, for Posttests #2, #3, and #4. The groups compared were the Center-Only group, the group who received one year of the parent involvement intervention (Center + PIE), and the group who received two years of the parent involvement intervention (Center + PIE I + PIE II). Covariates used in the analyses were the same as those reported for each measure on the earlier analyses (Tables 8.14 - 8.16).

The majority of results from these analyses are presented in Table 8.20. This table does not present data on all measures in order to simplify the table. Any measure where a significant difference between groups was found is presented in the table.

No statistically significant differences were found on the majority of the measures. The measures on which a significant difference ($p \leq .10$) was found are presented with further analyses in Table 8.21. Overall, the results from Table 8.20 suggest that the different durations of participation in the parent involvement component did not impact on outcome measures.

Table 8.21 presented information regarding the direction of differences for the measures on which a significant difference was found in Table 8.20. This table presents the effect size for each possible two-group comparison and a probability value based on that effect size.

Posttest #2. It is interesting to note that the group (Center + PIE I + PIE II) who received the most parent involvement reported the highest levels of depression symptomatology, significantly more than the Center-Only group. However, family cohesion was lowest for the Center + PIE I group, significantly more so than

Table 8.20

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

	Center-Only			Center + PIE I			Center + PIE I + PIE II				
Variables[*]	Adj.$\bar{x}$[^]	(SD)	n	Adj.$\bar{x}$[^]	(SD)	n	Adj.$\bar{x}$[^]	(SD)	n	ANCOVA F	p Value
POSTTEST #2											
• **Battelle Developmental Inventory**											
Personal/Social	130.9	(25.4)	37	128.3	(34.1)	14	132.8	(31.0)	19	.24	.79
Adaptive Behavior	85.6	(18.0)	37	87.2	(20.3)	14	87.8	(18.0)	19	.30	.74
Motor	116.3	(24.8)	37	113.5	(34.6)	14	116.7	(30.9)	19	.36	.70
Communication	67.6	(18.9)	37	65.8	(24.8)	14	69.2	(21.7)	19	.34	.71
Cognitive	65.1	(23.0)	37	62.9	(24.9)	14	69.6	(24.9)	19	1.31	.28
TOTAL	463.5	(97.7)	37	461.0	(129.2)	14	474.7	(115.9)	19	.38	.69
• **Parenting Stress Index (Total)**[♦]	249.3	(35.5)	35	246.0	(21.9)	13	254.1	(48.3)	19	.38	.68
• **Family Adaptation and Cohesion[♣] Evaluation Scales**											
Cohesion	37.0	(7.2)	34	33.7	(6.2)	14	39.1	(7.0)	18	4.99	.01
Adaptation	21.2	(5.4)	34	21.0	(4.8)	14	19.7	(5.5)	18	.57	.57
• **CES-D**[♦]	29.4	(6.7)	36	32.1	(10.7)	14	34.7	(13.0)	19	2.58	.08
• **Child Improvement Questionnaire**											
Professional	19.9	(4.5)	36	17.2	(3.4)	13	20.7	(3.5)	19	3.14	.05
Divine Intervention	11.2	(3.4)	36	12.5	(2.9)	13	11.2	(4.0)	19	.80	.46
Parent	23.8	(2.8)	36	23.4	(3.6)	13	24.3	(2.9)	19	.38	.69
Child	21.4	(4.0)	36	20.5	(3.3)	13	19.3	(3.9)	19	2.27	.11
Chance	12.7	(4.6)	36	11.3	(3.3)	13	8.6	(2.8)	19	6.54	.00
TOTAL	88.8	(14.3)	36	85.4	(9.6)	13	83.9	(9.2)	19	.96	.39
• **Parent as a Teacher (PAAT)**											
Creativity	26.7	(1.6)	34	26.4	(1.3)	13	27.5	(3.3)	19	1.27	.29
Frustration	27.1	(2.1)	34	26.0	(1.6)	13	27.1	(3.7)	19	1.08	.35
Control	25.7	(2.7)	34	26.7	(2.0)	13	27.2	(3.0)	19	1.97	.15
Play	28.8	(2.5)	34	28.3	(1.9)	13	30.0	(3.3)	19	2.09	.13
Teaching/Learning	28.7	(2.7)	34	29.4	(2.2)	13	30.0	(3.4)	19	1.49	.23
TOTAL	136.9	(8.3)	34	136.1	(5.1)	13	142.3	(14.1)	19	2.64	.08

(continued)

[♣] Scores for the FACES are derived from linear scoring.

[♦] Lower scores are preferred

[^] Adjusted means are presented. Covariates used were the same as those reported in Tables 12.13 - 12.15.

Table 8.20 (continued)

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

	Center-Only			Center + PIE I			Center + PIE I + PIE II				
Variables*	Adj.$\bar{x}$^	(SD)	n	Adj.$\bar{x}$^	(SD)	n	Adj.$\bar{x}$^	(SD)	n	ANCOVA F	p Value
POSTTEST #3											
• **Battelle Developmental Inventory**											
Personal/Social	144.5	(17.2)	37	143.2	(29.8)	13	147.3	(26.6)	18	.29	.75
Adaptive Behavior	94.5	(15.5)	37	93.8	(20.6)	13	98.9	(22.0)	18	1.01	.37
Motor	124.8	(23.1)	37	124.4	(34.2)	13	126.5	(32.4)	18	.14	.87
Communication	77.5	(20.9)	37	74.4	(29.3)	13	79.4	(21.8)	18	.53	.59
Cognitive	76.7	(22.8)	37	68.5	(27.1)	13	77.9	(24.7)	18	2.03	.14
TOTAL	517.6	(89.0)	37	508.0	(135.1)	13	526.7	(117.7)	18	.42	.66
• **Parenting Stress Index (Total)**♦	247.4	(34.4)	37	237.9	(32.8)	13	244.0	(52.7)	18	.46	.63
• **Family Adaptation and Cohesion**+ **Evaluation Scales**											
Cohesion	37.7	(6.7)	36	36.8	(6.0)	13	39.9	(4.6)	18	2.05	.14
Adaptation	21.8	(5.7)	36	22.8	(5.5)	13	20.7	(4.6)	18	.73	.48
• **CES-D**♦	30.6	(9.4)	37	31.4	(9.4)	12	29.9	(8.0)	18	.13	.88
• **Child Improvement Questionnaire**											
Professional	18.3	(4.2)	37	17.0	(4.8)	13	20.1	(3.3)	18	2.21	.12
Divine Intervention	12.5	(3.6)	37	11.6	(4.2)	13	12.0	(3.1)	18	.33	.72
Parent	22.4	(3.9)	37	23.2	(3.2)	13	24.4	(2.2)	18	2.28	.11
Child	20.8	(3.0)	37	21.7	(4.5)	13	21.1	(3.4)	18	.34	.71
Chance	11.5	(4.1)	37	10.9	(3.4)	13	9.1	(2.4)	18	3.85	.03
TOTAL	85.5	(12.8)	37	84.6	(13.1)	13	86.1	(7.1)	18	.08	.93
• **Parent as a Teacher (PAAT)**											
Creativity	26.9	(1.8)	33	26.6	(1.9)	12	26.6	(2.1)	18	.26	.77
Frustration	27.0	(1.9)	33	26.2	(1.9)	12	28.0	(2.9)	18	3.16	.05
Control	25.5	(2.8)	33	27.6	(2.4)	12	27.2	(2.6)	18	3.85	.03
Play	29.1	(2.6)	33	29.0	(2.6)	12	30.5	(2.6)	18	2.41	.10
Teaching/Learning	29.2	(2.8)	33	28.5	(2.4)	12	30.3	(2.6)	18	2.01	.14
TOTAL	137.2	(8.4)	33	139.0	(7.6)	12	142.1	(9.8)	18	1.80	.17

(continued)

+ Scores for the FACES are derived from linear scoring.

♦ Lower scores are preferred

^ Adjusted means are presented. Covariates used were the same as those reported in Tables 12.13 - 12.15.

Table 8.20 (continued)

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

	Center-Only			Center + PIE I			Center + PIE I + PIE II				
Variables	Adj.$\overline{x}$^	(SD)	n	Adj.$\overline{x}$^	(SD)	n	Adj.$\overline{x}$^	(SD)	n	ANCOVA F	p Value
POSTTEST #4											
• **Woodcock-Johnson**											
Broad Knowledge	45.0	(13.0)	37	43.6	(17.3)	15	47.6	(16.6)	19	.69	.50
Skills	45.9	(24.1)	37	41.5	(23.4)	15	48.3	(25.6)	19	.74	.48
• **Scales of Independent Behavior**											
Motor	66.6	(13.2)	37	66.8	(20.2)	15	70.0	(18.9)	19	.79	.46
Social & Communication	85.9	(11.8)	37	84.9	(18.6)	15	88.4	(16.4)	19	.58	.56
Personal Living	127.6	(28.2)	37	132.0	(42.6)	15	134.5	(36.3)	19	.84	.44
Community Living	50.3	(24.0)	37	57.9	(26.3)	15	53.6	(20.5)	19	1.15	.32
TOTAL	328.5	(69.7)	37	344.8	(102.4)	15	345.4	(87.3)	19	1.01	.37
• **Parenting Stress Index (Total)**♦	241.5	(46.0)	36	232.2	(31.6)	14	241.2	(44.4)	18	.50	.61
• **Family Adaptation and Cohesion**† **Evaluation Scales**											
Adaptation	21.1	(5.2)	36	22.1	(5.1)	14	22.2	(4.0)	18	.46	.63
Cohesion	37.8	(6.8)	36	37.0	(5.9)	14	39.8	(6.7)	18	1.18	.32
• **Child Improvement Questionnaire**											
Professional	19.3	(4.2)	36	16.9	(4.3)	14	19.3	(3.5)	18	1.88	.16
Divine Intervention	11.7	(3.2)	36	12.3	(2.7)	14	11.0	(4.1)	18	.57	.57
Parent	23.1	(3.9)	36	21.7	(5.0)	14	24.6	(3.0)	18	2.21	.12
Child	21.4	(2.6)	36	19.1	(7.0)	14	21.3	(4.5)	18	1.74	.18
Chance	11.0	(3.7)	36	11.8	(4.8)	14	9.5	(2.9)	18	2.15	.13
TOTAL	86.1	(9.7)	36	82.0	(9.8)	14	86.1	(9.7)	18	1.28	.29
• **Parent as a Teacher (PAAT)**											
Creativity	26.4	(2.5)	36	26.5	(1.3)	14	26.0	(2.3)	18	.34	.71
Frustration	27.7	(2.7)	36	26.1	(.8)	14	27.1	(1.7)	18	2.82	.07
Control	25.7	(2.4)	36	26.9	(1.9)	14	25.8	(2.5)	18	1.83	.17
Play	29.3	(2.4)	36	28.6	(1.8)	14	28.9	(2.1)	18	.66	.52
Teaching/Learning	29.6	(3.6)	36	28.9	(2.9)	14	28.9	(2.8)	18	.45	.64
TOTAL	138.8	(10.1)	36	137.1	(5.5)	14	136.4	(8.2)	18	.48	.62
• **SPECS**											
Communication	6.6	(1.7)	20	6.7	(1.1)	7	7.0	(1.7)	16	.34	.71
Sensorimotor	16.8	(2.3)	20	16.3	(1.5)	7	17.5	(2.9)	16	.66	.52
Physical	12.4	(1.9)	20	12.5	(1.9)	7	13.4	(1.9)	15	1.21	.31
Self-Regulation	14.5	(3.4)	20	14.7	(3.7)	7	15.2	(2.7)	16	.21	.81
Cognition	6.3	(2.4)	20	5.5	(1.5)	7	7.7	(1.7)	16	4.49	.02
Self/Social	13.8	(3.6)	20	13.2	(3.7)	7	16.1	(2.7)	16	4.12	.02

† Scores for the FACES are derived from linear scoring.

♦ Lower scores are preferred

^ Adjusted means are presented. Covariates used were the same as those reported in Tables 12.13 - 12.15.

Table 8.21

Direction of Significant Results from Oneway Analysis of Covariance (Table 8.20) for Des Moines Parent Involvement Study

	Center Only vs. Center + PIE I		Center Only vs. Center + PIE I + PIE II		Center + PIE I vs. Center + PIE I + PIE II	
Variable	ES[*]	p[♦] Value	ES[*]	p[♦] Value	ES[*]	p[♦] Value
POSTTEST #2						
• CES-D	.34	.29	.60	.04	.22	.55
• Child Improvement Questionnaire						
Professional	-.66	.05	.18	.54	1.02	.01
Chance	-.33	.32	-1.03	.00	-.90	.02
• FACES Cohesion	-.53	.10	.29	.32	.87	.02
• PAAT Total	-.11	.74	.52	.07	.59	.11
POSTTEST #3						
• Child Improvement Questionnaire						
Chance	.27	.42	-.68	.02	-.66	.08
• PAAT						
Frustration	-.43	.21	.49	.10	.76	.05
Play	-.04	.90	.55	.07	.06	.13
Control	-.73	.02	-.25	.39	.76	.04
POSTTEST #4						
• PAAT						
Frustration	-.73	.02	-.25	.39	.76	.04
• SPEC						
Cognition	-.37	.42	.67	.05	1.33	.01
Self/Social	-.18	.68	.72	.04	.99	.04

[*] ES was computed by subtracting the Adj.$\bar{x}$ of the second listed group from the mean of the first listed group and dividing this by the pooled SD for the two groups. For example:

$$\frac{\text{Adj.}\bar{x}\text{ (Center + PIE I + PIE II) - Adj.}\bar{x}\text{ (Center + PIE I)}}{\text{SD (Pooled)}}$$

[♦] The *p*-value was obtained by converting the ES into a *t*-score and taking the *p*-value for that *t*-score.

either of the other two groups. Logically, the CES-D and cohesion results should not co-occur, suggesting that chance factors may play a role in these findings.

On the chance scale of the CIQ, the results indicate that the Center + PIE I + PIE II attributed significantly less of their child's progress to chance than either the Center-Only group or the Center + PIE I group. In fact, the Center-Only and Center + PIE I groups did not differ on this measure. Also, the Center + PIE I + PIE II group attributed significantly more of their child's progress to professionals than the Center + PIE I group, while the Center-Only group attributed significantly less of their child's progress to professionals than the Center + PIE I group.

A difference was also found on the total score of the PAAT. Both the center + PIE I and Center + PIE I + PIE II groups reported more appropriate behaviors in teaching interactions with their child. The center + PIE I and Center + PIE I + PIE II groups were not different on this measure.

Posttest #3. The significant finding on the CIQ chance subscale reflect those found at Posttest #2. The findings on the PAAT suggest that the Center + PIE I + PIE II group was less frustrated, more appropriately playful, and more appropriately controlling with their child in teaching interactions than the Center-Only group. The Center + PIE I and Center + PIE I + PIE II groups significantly differed on their frustration levels in teaching interactions, with the Center + PIE I + PIE II group reporting less frustration. The Center + PIE I and Center + PIE I + PIE II groups also reported more appropriate control methods in teaching interactions than the Center-only group. These findings on the PAAT are consistent with the PAAT Posttest #2 results.

Posttest #4. The results from Posttest #4 are interesting in that some differences are in areas of child functioning, as reported by the teacher (SPECS), rather than in areas assessing parent perceptions. The results in Table 8.21 suggest an advantage for children whose parents were in the Center + PIE I + PIE II group over the Center + PIE I group, and over the Center-Only group. These data are not based on the entire study sample and, therefore, a cautious interpretation of results is required.

The findings from the frustration scale of the PAAT have shifted from those that occurred at Posttest #3. At Posttest #3, the Center-Only group reported more frustration in teaching interactions. At posttest #4, these perceptions of frustration are significantly greater from the Center + PIE I group. This drastic change in group significance suggest that either chance factors affected earlier results or that changes in parent attitudes have occurred. If additional changes have occurred, they should be supported by Posttest #5 data.

Treatment Verification Analyses

An analysis of the treatment verification data was conducted. The finding of group differences on the intervenor rating of parents (Table 8.5) raised questions regarding the reason for this difference. That is, did the PIE intervention provide parents with skills that enabled them to interact more effectively with teachers, or were the ratings the result of other factors (as pretest differences did exist between groups)? The relation of parent attendance at group meetings (by Center + PIE group parents) and parent satisfaction with intervenor ratings were other issues that were of interest.

Correlational analyses were conducted to begin the examination of these issues. Correlations of parent attendance (by Center + PIE group parents), intervenor ratings of parents (for all parents), and parent satisfaction (for all parents) with treatment verification measures, family demographic characteristics, and information from posttest family measures were conducted. Correlations with family measures and the majority of demographic characteristics revealed no significant correlations. Data presented in Table 8.22 represent correlations that provide some interesting findings regarding the current data and raise suggestions for further analyses. Intervenor ratings of parents appear influenced by a number of factors, primarily parent education and income; although child attendance at school and lack of child progress in school also was related to intervenor ratings. When these demographic factors were included in an Analysis of Covariance with intervenor rating (sum of the three areas) as dependent variable and treatment group as independent variable, no differences between groups were found (F = 2.46, ES = 0.38, p = .13).

Table 8.22

Correlational Analyses of Treatment Verification Data For Des Moines Parent Training Study

	Parent Attendance[&]		Intervenor Rating[^]		Parent Satisfaction[#]	
Variable	r	p	r	p	r	p
• Mother's education	.32	.07	.56	<.000	.11	.25
• Father's education	.37	.05	.51	<.000	-.03	.41
• Family income	.42	.03	.61	<.000	.15	.17
• Child school attendance	.22	.10	.23	.06	.04	.40
• Parent attendance[&]	—	—	.55	.002	.00	.50
• Intervenor rating[^]	.55	.002	—	—	.06	.33
• Parent satisfaction[#]	.00	.50	.06	.33	—	—
• Child progress[+]	-.12	.26	-.20	.06	.04	.38

[&] Based on actual parent attendance at PIE I meetings.

[^] Based on the sum of three questions assessing parent support, knowledge, and attendance as perceived by the teacher at Posttest #1.

[#] Based on seven questions assessing parent satisfaction obtained at Posttest #1.

[+] Child progress is based on difference in BDI total raw score from Pretest to Posttest #1.

These findings also suggested that the teacher ratings from the classroom follow-up be repeated with covariates. If teachers are affected by these parent factors in preschool, then these factors could affect teachers at other levels. Analyses of covariance were conducted on the teacher-provided ratings of attendance, knowledge, and cooperation (Table 8.19) using parent income and mother education as covariates. These analyses did change the results of all three analyses. Parent attendance was no longer significantly different (F = .94, p = .34, ES = .14) between groups, nor was parent knowledge (F = .75, p = 13, ES = .13). The results for parent cooperation was only mildly impacted.

Parent education and income was also associated with parent attendance at PIE meetings. Perhaps parents with higher levels of education are more comfortable in a class-like setting and are more willing to attend regularly. Unlike parent attendance at meetings and intervenor ratings, parent satisfaction with the Center-Based intervention program is unrelated to parent education, child progress, or intervenor perception. A number of possibilities arise: (a) more sensitive measures of satisfaction may be needed; (b) parents may not have a clear idea of what represents a good versus poor program; or (c) parents may be truly satisfied.

These treatment verification analyses raise interesting questions for the field of early intervention. Evaluations in the past have overlooked these variables and as a result may have obtained biased data (Casto & Mastropieri, 1986; Cooke & Poole, 1982). These initial analyses make clear the importance of verification data. Verification data cannot only help clarify results obtained, but also raise new areas for investigation.

Conclusions

This study investigated the effect on children, parents, and families of placement in a center-based early intervention program supplemented by parent-attended meetings focused primarily on training parents intervention skills, compared to the same program without the parent component. Results of this study indicate that the supplemental parent involvement component had a minor impact on children's developmental progress immediately after intervention, but this progress was not maintained over time nor by the continuation of a parent involvement intervention. The only aspect of parent or family functioning consistently impacted was that parents who received the parent involvement component were less likely than other parents to attribute their child's developmental progress to chance. These impacts occurred at a cost of approximately $1,700 per child per year for the parent involvement component.

It is difficult to succinctly summarize the results of such a comprehensive study. There are measures where a statistically significant difference is found at one posttest but not the next. It is difficult to determine if these differences reflect benefits of the program or random fluctuations within a large data set. Actual differences must be demonstrated by consistent findings within a posttest and across posttests. Such consistency was not evidenced on the majority of measures.

Data from longitudinal aspects of this study that are examining teacher judgments and child classroom placements are providing some initial results in favor of the Center + PIE group. These results, however, must be viewed cautiously at this time. Longitudinal data will determine if these differences are actual, sustained differences or merely random fluctuations in the data.

It is clear that the parent component used in this study is only one type of parent involvement possible from a continuum of parent involvement options. The parent component used in this study, though, is representative of the most common approach to parent involvement (White et al., 1989) (i.e., parent meetings focused on training intervention skills as a supplement to a center-based program). The findings from this study do not imply that parent involvement is not beneficial nor that parents cannot be effective interventionists for their child with disabilities. These results only imply that parent involvement, when conducted as described in this study, does not provide long-term benefits for child development or for family functioning.

In interpreting the results of this study, it should be remembered that parent attendance at meetings was far from perfect. However, attendance at parent meetings in this study typifies findings when using lower SES groups (Baker & McCurry, 1984). Regardless of attendance, parents learned the concepts taught in PIE I (as demonstrated by the test of Parent Knowledge), at least at a level that allowed them to verbalize information presented. This is probably due to the repeated presentation of critical knowledge in PIE, as in many other parent curricula providing information (Innocenti, Rule, & Fiechtl, 1989). These factors further support the "typical" nature of this intervention.

This study represents a methodologically-sound analysis of adding one type of parent involvement to an existing center-based early intervention program. The results of this study do not endorse this type of intervention if the goal is to make a sustained impact on child development or family functioning. This type of parent involvement may be defensible from a social/ethical perspective.

Regardless of arguments for or against this type of parent involvement, this study demonstrates that questions regarding parent involvement can be addressed with methodologically sound experimental studies. Research such as this will help to define not only what types of parent involvement "work," but will also help the field of early intervention elucidate its arguments for involving parents. Whatever the role of parents is determined to be, it should be one that is both empirically and logically defensible.

UTAH PARENT INVOLVEMENT STUDY (1986)

Project #9

Comparison: Children with Moderate to Severe Disabilities--Center-based intervention plus parent training versus center-based intervention only.

Local Contact Person: Don Link, Director, Developmental Disabilities, Inc.

EIRI Coordinator: Glenna Boyce, Ph.D.

Location: Salt Lake City, Utah

Date of Report: 11-12-91

Rationale for Study

One of the most frequent claims of researchers, administrators, and practitioners is that early intervention programs which include parent involvement will be more effective than programs without parent involvement (Bronfenbrenner, 1974; Garland, Swanson, Stone, & Woodruff, 1981; Johnson & Chamberlin, 1983; Karnes & Lee, 1978; Lazar, 1981; Parker & Mitchell, 1980; Simeonsson et al., 1982). The benefits of parent involvement in their child's intervention has become a socio-political "truth" and has led to a government mandate with the passage of P.L. 99-457 and 101-476. However, as yet, there is little empirical evidence to support this view. Relatively few studies have investigated the notion that programs which include parental involvement are more effective than programs without parent involvement, and most of these are not of good quality (White et al., 1989). The generalizability of findings have been limited because many studies have lacked sound methodology (e.g., did not use pre- and posttest assessment, random assignment, matched samples except for treatment difference, or "blind" assessment). Also most studies have been cross-sectional studies; the longitudinal effects have not been investigated.

Many types of parent involvement programs have been tried. Some examples are teaching the parent to provide therapy, improving the parent/child relations, using parents as aides, and providing parental support programs. Programs which use parents to assist in delivering intervention activities (that are designed to enhance the child's development) are the most frequent type of parent involvement according to past research (White et al., 1989). Because no type of parent involvement has been identified as clearly the best (Powell, 1986), it is logical to investigate the effects of one of the most typical approaches to begin building a sound base of empirical findings concerning whether there are benefits associated with parent involvement.

Most of the previous studies have addressed only child effects. The work of several investigators has suggested a link between child management skills and family functioning (e.g., Koegel, Schreibman, Britten, Burke, & O'Neil, 1982; Patterson, 1979; Patterson & Fleishman, 1979; Wahler, Leske, & Rogers, 1979); however, additional research is needed to determine the nature of these effects. Therefore, it would be beneficial for a parent involvement investigation to also study the possible benefits for the families in addition to the effects for the child.

Another consideration is that most previous studies of parent involvement in early intervention were conducted with disadvantaged children; the findings from these studies may not generalize to a population of children with moderate to severe disabilities. The problems associated with these two populations appear to be sufficiently different that each needs to be investigated.

Therefore, the purpose of this study was to investigate the immediate and long-term effects of adding one type of parent involvement component to an existing early intervention program. Effects on the developmental progress of children with disabilities and the effects on family functioning were examined. The parent involvement program investigated was primarily designed to involve parents in providing intervention activities for their children, to assist parents in working with interventionists, and through the medium of the instructional sessions, provide a support group including the instructors and other parents.

Review of Related Research

Historically, the involvement of parents in their children's education has been considered to be a vital component of successful programs for both normal and disadvantaged children. Founded upon a belief in the importance of parent-child interaction and built on the idea that families were the primary source of values and behaviors of children, parent involvement of different types has been seen by many social scientists, practitioners, and advocates as a way to solve a variety of societal problems. Therefore, parent education became an important part of the government's social policy. The Head Start program, for example, which served as a guide for many subsequent early intervention projects, included a parent involvement component as an integral part of its activities. Bronfenbrenner's (1974) report was especially influential in arguing that early intervention with children who are disadvantaged was more effective when parents were involved in the program, asserting that the increased participation of parents provided the value change that led parents to encourage and reward their children's learning activities. Lazar's (1981) oft cited analysis of 14 studies of early intervention for children who were disadvantaged reaffirmed this contention in finding that direct participation of parents was significantly related to positive program outcomes.

The benefits associated with parent involvement are believed to be well established with all children, but most of the evidence comes from studies done with children who are disadvantaged. IQ gains and fewer special education placements (Haskins & Adams, 1982), children's sociability and cooperation (Clarke-Stewart, 1982), increased infant responsiveness, improvement in children's school performance, and positive effects on maternal behavior (e.g., more facilitative language, flexible child-rearing patterns, awareness of parental role as educator) (Powell, 1986) have been reported as probable benefits from different types of parent involvement/ education programs. Some of these effects have been reported to be long-lasting (Jester & Guinah, 1983; Seitz, Rosenbaum, & Apfel, 1985) but, although immediate effects are often achieved, most follow-up studies show effects are not permanent or very long-lasting (Clarke-Stewart & Apfel, 1978; Clarke-Stewart, 1982).

Reviewers have urged caution in interpreting and generalizing these findings for several reasons. First, the research discussed thus far has generally been conducted with children who are disadvantaged. Because such programs have been considered to be effective with this population (and with more general populations as well), it was logical to extend them into use with families of children with disabilities. The number of self-help groups formed by parents of children with disabilities would seem to support a perceived need for assistance to parents in this area. The recent passage of P.L. 99-457, which mandates involvement of the family in the young child's education, asserts the federal government's acceptance of the belief that inclusion of the family will result in more effective early intervention. Regardless of parent and professional beliefs, and government policy, it is still important to systematically investigate the benefits of adding parent involvement components to intervention programs with populations of children with disabilities. In sum, very little systematic research has been done with this population and even the research with disadvantaged children is often contradictory (see White et al., in press); consequently, the evidence is thin. In spite of the absence of compelling evidence, Foster, Berger, and McLean (1981, p. 55) noted that "Parent involvement is a good idea that has become an essential and often unquestioned component of intervention programs for young handicapped children."

Second, reviewers have cited methodological problems in much of the previous research (Clarke-Stewart, 1982; White et al., 1989), and, therefore, question the conclusions of the previous reviewers. For example, a number of studies in this area used only indirect comparisons (that is, parent involvement is confounded with one or more additional variables such as setting or age at start). Often, no control or comparison group has been used. Only post or pre-post comparisons have been used, and random assignment has almost never featured, giving rise to questions about selection effects.

Third, other limitations in the research have been indicated. Often, treatment verification has not taken place to confirm that parents were involved in the program to the degree intended by the researcher. Few studies have been longitudinal in nature. Also, the foci of the research has often been limited to child outcome measures. Studies have not been concerned with family effects, although many researchers have argued that the family or parent benefits of parent involvement are greater than those demonstrated by the target child (Dunst, 1986). In addition, few studies have investigated cost-benefit information, despite general claims that parent involvement saves money.

Finally, a major limitation in the research so far stems from the fact that, in practice, parent involvement in programs for disadvantaged and disabled children has been defined in many ways (White et al., 1989). Two general types of parent involvement have been identified (Gatling & White, 1987): (1) those that use parents in some way to enhance the child's developmental progress (referred to hereafter as a parent-as-intervenor approach), and (2) those that provide assistance to parents or other family members to enhance family functioning, coping ability, satisfaction, or ability to manage the stress of having a child with a disability as a family member (referred to hereafter as family support approach).

The research comparisons of these parent involvement programs have also differed greatly in design. One study may compare parent-delivered intervention with no intervention and another may study an intervention program that included parent education and/or parent assistance in the classroom. The findings of all these studies have been lumped together to "prove" that parent involvement improves child development.

It is extremely important to investigate the most frequently used types of parent involvement in well-designed research studies to determine if benefits are found for the children with disabilities or their families. White et al. (1989) noted that 80% of almost 200 early intervention studies which included a parent involvement component used a "parent-as-intervenor" approach as either the sole focus or as the major focus of a parent involvement program which involved several other components. In most cases, the parent-as-intervenor approach was added to a center-based intervention program. Because this type of program is used most frequently, studies are needed to assess its benefits. Such a study needs to be a well-designed, longitudinal study that involves replication, random assignment to treatment and control groups, treatment verification, and multiple measures of child and family functioning. Only then can the numerous questions concerning costs and effects of parent involvement/instruction components begin to be addressed.

Overview of Study

The long-term effectiveness of adding a parent involvement component with a parent-as-intervener focus to an on-going center-based intervention program was investigated in this study. Fifty-six children with moderate to severe disabilities had been in a ½-day, 5-day-per-week, center-based preschool program in the Salt Lake City, Utah, area. The children were randomly assigned to either the center-based intervention plus parent involvement component or the center-based only intervention (hereafter referred to as parent involvement and center-based groups). The parents of the children in the parent involvement group took part in the Parents Involved in Education (PIE) program, which consisted of 15 1½ hour weekly training sessions from January through April, 1987. The parents of the center-based group did not participate in the PIE program. All children were tested prior to, immediately after, and once yearly for four more years following the implementation of the parent involvement component, making a total of five posttests. Parents also completed measures of family functioning at each posttest.

Methods

Subjects

Preschool children with moderate to severe disabilities and their families who were participating in an early intervention program were considered for inclusion in this study. The preschool intervention program was offered through the services of the Developmental Disabilities, Inc. (DDI), a private, non-profit agency located in Salt Lake City, Utah. The Battelle Developmental Inventory was used as a screening instrument to determine children's eligibility for services. Children scoring at least 1½ standard deviations below the mean in at least two areas, or 3 standard deviations below the mean in one area qualified for services at the center.

Recruitment. Parents of eligible children were sent a letter inviting them to participate in the research. Sixty-seven parents responded, but nine were unable to participate due to reasons such as lack of transportation, illness, etc. Thus, 58 subjects were pretested, but two dropped out of the program after the pretest. Parents signed an informed consent letter which stated their willingness to be randomly assigned to either group (center-based or parent involvement), and specified other responsibilities of the parent, the intervention program and the research staff. Subject recruitment was completed in November, 1986.

Assignment to groups. Prior to the initiation of treatment, subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups, a parent involvement group, plus center-based intervention, or a center-based intervention-only group. To increase the probability of comparable groups, subjects were assigned to groups randomly, after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (22-34 months, 35-47 months, and over 48 months) and level of parent motivation as perceived by each child's teachers. Stratifying subjects in this way resulted in subjects falling into one of six mutually exclusive cells. Within each of the six cells, subjects were rank ordered from low to high based on their developmental test scores obtained from the Battelle Developmental Inventory (BDI) and other assessment instruments previously administered as part of the eligibility process for receiving services at the intervention center. After subjects were categorized and rank ordered within categories, the subject with the lowest BDI score in each cell was randomly assigned to one of the two conditions, and the remaining subjects in that cell were alternately assigned to the two conditions.

Demographic characteristics. The children in the sample, at the pretest, ranged in age from 23 to 61 months, with the average age of 42 months. Most of the parents were in their late twenties or early thirties. As a group, the parents were fairly well educated with the average education for both mothers and fathers being more than 13 years. Almost all of the families were Caucasian, and the demographic data indicated that most of them would be considered middle class. Typically, the children were living with both parents and a majority of the mothers (66%) did not report any employment outside the home. An average of two siblings were reported, making the average number of children per family three (including the child with a disability). Table 9.1 presents a demographic comparison of the center-based and the center-based plus parent involvement groups at pretest time based on t-tests.

The p-values and the effect sizes indicate that the two groups were generally comparable in terms of demographic characteristics. Of the 19 variables measures, there were no statistically significant differences on 17. In the parent involvement group, more children were living in intact families (with both parents living in the home) (p value = .04, ES = .47), and more families included other children with disabilities (p value = .02, ES = 1.0).

Attrition. Two subjects dropped out between the time of the pretest and the Posttest #1. One of these subjects cited the birth of a new baby and a language barrier (the subject was a recent immigrant) as reasons for dropping out of services altogether. The other subject dropped out of the study because the mother decided to withdraw her child from services at the intervention center. Thus, the sample at first posttest consisted of 56 subjects, with 28 in each group.

Data from 40 subjects were available for analyses at the second posttest with 16 subjects not participating. Of these 16, 7 subjects did not participate at the time of second posttest due to lack of interest, and 1 subject declined to participate due to the death of the father the week before the second posttest testing. Two subjects moved, one to El Paso and one to Nevada, and four other subjects could not be located. (Standard procedure for locating lost subjects was first, to contact next of kin, and second, to send a certified letter. For these cases, neither procedure proved successful.) Finally, two children did not have Battelle Developmental Scores, but had family measure scores. Thus, second posttest data was available for 20 subjects in the comparison group and 20 subjects in the parent instruction group. Analyses were performed to determine if those children who were not tested at Posttest #2 were any different on the pretest and demographic variables from those who were tested. The pretest scores of those tested and those

Table 9.1

Comparison on Key Demographic Variables of the Center-Based and Parent Involvement Groups in the 1986 Parent Involvement Study

	Center-Based			Center-Based + PIE			p Value	ES^
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Age of child in months as of 11/15/86	43.0	10.5	28	41.7	10.6	28	.62	-.12
• Age of mother in years	33.4	5.8	28	31.9	5.6	28	.33	-.26
• Age of father in years	35.9	6.2	27	33.8	6.4	28	.23	-.34
• Percent Male*	57.1		28	42.9		28	.29	.26
• Years of Education--Mother	13.8	1.7	28	13.5	1.5	28	.51	-.18
• Years of Education--Father	13.8	2.1	28	14.0	2.1	28	.66	.10
• Percent with both parents living at home*	78.6		28	96.4		28	.04	.47
• Percent of children who are caucasian*	92.9		28	100.0		28	.16	.27
• Hours per week mother employed	8.4	13.7	26	6.4	10.8	28	.55	-.15
• Hours per week father employed	42.8	15.5	21	36.6	18.9	26	.23	-.40
• Percent of mothers employed as technical managerial or above*	10.7		28	3.6		28	.31	-.22
• Percent of fathers employed as technical managerial or above*	61.5		26	46.2		26	.28	-.28
• Total household income[+]	\$21,785	\$12,728	28	\$23,314	\$13,684	27	.67	.12
• Percent with mother as primary caregiver*	96.4		28	100.0		28		.15
• Percent of children in daycare more than 5 hours per week*	11.1		27	3.7		27	.31	-.22
• Number of siblings	2.1	1.7	28	2.3	1.1	28	.71	.12
• Number of siblings with disabilities	.1	.3	28	.4	.7	28	.02	1.00
• Percent with English as primary language*	96.4		28	100.0		28	.32	.15
• Maternal PPVT (standard)[\$]	99.6	18.0	28	99.3	17.1	27	.97	-.02

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

[+] Income data were converted from categorical to continuous data by using the midpoint of each category.

[^] Effect size is defined here as the difference between the groups (center + PIE minus center) on the ANCOVA scores, divided by the unadjusted standard deviation of the center-based intervention group. (See Glass, 1976; Tallmadge, 1977; & Cohen, 1977, for a more general discussion of the concept of Effect Size.) The sign of ES only indicates direction of difference; no value judgement is intended.

[\$] Maternal PPVT measures mother's vocabulary. It correlates highly with IQ measures. This measure was taken at Posttest #1, but was considered a pretest variable.

not tested at Posttest #2 were very similar (see Table 9.2); therefore, the attrition did not appear to influence the posttest results.

Table 9.2

Comparison on Pretest Variables of Subjects Who Withdrew from Study With Those Who Completed Posttest #2 in the 1986 Utah Parent Involvement Study

								Study Status							
		Center-Based			Center-Based + PIE			In Study			Out of Study				
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p* Value	ES^*
Age at Pretest	IN	42.4	11.9	20	41.6	11.6	20	42.0	11.6	10					
	OUT	13.3	2.3	8	14.3	2.4	8								
Income	IN	$22,325	$13,496	20	$21,944	$10,752	19	$22,712	$12,458	40	$22,066	$15,161	15	.87	.05
	OUT	$20,437	$11,296	8	$23,928	$19,490	7								
Family Adaptability	IN	25.5	5.9	20	25.3	5.4	19	25.4	5.6	39	23.3	5.3	16	.20	.38
	OUT	22.0	5.2	8	24.6	5.3	8								
Family Cohesiveness	IN	38.1	9.0	20	39.6	4.6	19	38.8	7.1	39	38.6	4.8	16	.92	.03
	OUT	37.4	5.6	8	39.9	3.9	8								
Family Resources	IN	113.2	16.9	20	112.9	16.7	18	113.0	16.6	38	114.8	21.8	16	.75	-.11
	OUT	117.8	22.0	8	111.8	22.6	8								
Family Support	IN	27.5	11.0	19	29.1	9.6	19	28.3	10.2	38	31.8	11.3	13	.31	-.34
	OUT	31.0	12.9	7	32.7	10.3	6								

^ $ES = \dfrac{\bar{x}_{in} - \bar{x}_{out}}{SD_{in}}$

* The p value and ES are based on comparison of study status (i.e., in study, those who were tested at that posttest versus out of study, those who were not tested at that posttest). The sign of ES only indicates direction of difference; no value judgment is intended.

At Posttest #3, substantial efforts were made to retrieve subjects not tested at Posttest #2; 51 children and their families completed the measures (25 in the parent involvement group and 26 in the center-based group), leaving 5 who were not tested. Two of these lived in states where testers could not be located. The mothers of two who refused to participate at Posttest #2 refused to be reinstated, and one was not located.

Participation remained high at Posttest #4 with 52 children and their families tested. All four children who were not tested were from the parent involvement group. Two of these had declined to participate since Posttest #1, one died in December, 1989, and one's mother declined to participate this year.

At Posttest #5, 53 children were tested. Those not tested included the two who had not participated since Posttest #1 and one who died after Posttest #3.

Comparison analyses of subjects tested at the third, fourth, and fifth posttests with those not tested at the same posttest were performed to determine if those children who dropped out of this study were any different on the various pretest or demographic variables from those who remained in the study. None of these analyses revealed statistically significant differences although children who dropped out had lower BDI scores, and had mothers who reported less stress, more sources of social support, and higher levels of father education. Because the number of children is so small, the effect of attrition would have been to have slightly raised the BDI scores and to slightly lower the scores for perceptions of stress and support in the center-based plus parent involvement group. The effect of these changes, however, is insignificant in every way and does not alter the conclusions from the analyses presented later in this report.

Intervention Programs

The purpose of this study was to compare a center-based intervention group with a center-based intervention group whose parents participated in one particular type of parent involvement. A description of these treatments follows.

Center-Based Intervention Program. Children in this group attended an existing 3-hour-per-day, 5-day-per-week, center-based early intervention program. Each group of 9-12 children was instructed by a special education teacher who was assisted by a paraprofessional aide. The average number of children in the classrooms was 9.75. During a typical day, children were instructed in developmental areas such as motor, speech/language, self help, cognitive, and social skills. Instructional activities were developed from comprehensive assessments. Items were drawn from a number of curricula with no single, specific commercial curriculum being used to determine intervention goals and activities. Children received services in different educational formats (i.e., large group, small groups, and one-to-one) according to their individual needs which had been prioritized on IEPs developed by the parents, the special education teacher, an aide, and a motor and/or language therapist. Teachers were certified in special education, while aides were not. Certified language and motor therapists provided individualized language and motor instruction to the children. These therapists also assisted teachers and paraprofessional aides with implementation of activities. The teachers' primary contact with parents about their child's progress was when the parents brought or picked the child up from school and their IEP consultations. Several parents volunteered to do occasional work in the classrooms.

Center-Based Plus Parent Involvement Intervention Program. Children in this group attended the same center-based program described above. The children in both groups were scattered among the classrooms at the center. Parents of children in this group also participated in an education program based on the Parents Involved in Education (PIE) (Pezzino & Lauritzen, 1986) instruction package which was designed to improve the parents' skills in teaching their children and to help the parents be more competent partners in the intervention process. This type of parent involvement program was chosen because it was similar to the parent involvement programs most frequently described in the existing literature.

The PIE instructional modules were designed to provide parents with a systematic conceptual and hands-on experience in areas such as child development, observation and recording, targeting intervention behaviors, teaching processes, decision making, and communicating with professionals. The training format consisted of small group lecture, discussion, and demonstration. The curriculum included the following topics: (1) introduction and overview, (2) objective observation of child behavior, (3) defining and measuring behavior, (4) principles of behavior management, (5) analyzing behavior chains, (6) theories of child development, (7) testing and assessment, (8) criterion-referenced assessment, (9) developing learning objectives, (10) P.L. 94-142 and IEPs, (11) intervention strategies, (12) factors related to teaching success, (13) practice teaching session, (14) determining appropriate interventions, (15) communicating with professionals, (16) stress management, and (17), review, comments, concerns, and questions.

PIE instructional sessions were taught either by a social worker or the director of the intervention center. Average group size consisted of between 8 and 12 parents. Instruction sessions consisted of 15 ninety-minute sessions, held weekly for a period of four months. In addition to these sessions, parents were asked to practice the training activities at home with their children. They were asked to choose a target behavior for the child (such as a self-help or behavioral skill; e.g., compliance, dressing, etc.), implement an intervention program, and measure progress by comparing successful completion of the task before and after the intervention. A part of each PIE instructional session was designed to provide an opportunity for parents to form support networks and discuss challenges associated with parenting a child with a disability.

Treatment Verification

A number of procedures were implemented to verify that the intervention program occurred as planned. Child attendance at the center-based program was recorded daily and sent to EIRI on a monthly basis. As shown in Table 9.3, child attendance exceeded 65% for both the parent involvement and comparison groups. Attendance of parents at the PIE sessions was recorded weekly and these data were sent to EIRI on a monthly basis. The parents, on the average, attended 9 of the 15 sessions; one parent attended all 15 sessions and one parent attended none.

Parent ratings of the intervention services provided additional information about the nature of the treatment delivered to children. Parents rated seven aspects of the intervention program on a 1- (poor) to 4- (excellent) scale. Parents in both

Table 9.3

Comparison of Treatment Verification Variables for Center-Based and Parent Involvement Group for 1986 Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p[**] Value	ES[^]
POSTTEST #1								
• Child's school attendance (%)	68.8		28	65.6		27	.64	-.02
• Parent Attendance at PIE Instruction	0.0	(0.0)	28	8.7	(4.3)	28		
• Test of Parent Knowledge[$]	14.0	(5.5)	28	18.0	(5.5)	28	.01	.73
• Parent ratings of educational services[*]								
Staff	3.4	(.5)	28	3.4	(.6)	27	.91	.00
Communication	3.3	(.6)	28	3.4	(.6)	27	.61	.16
Child's goals/activities	3.2	(.6)	28	3.3	(.6)	27	.61	.18
Opportunity to participate	3.3	(.7)	28	3.5	(.5)	27	.09	.31
Range of services	3.0	(.7)	28	3.2	(.7)	27	.23	.30
Program in general	3.2	(.6)	28	3.3	(.7)	27	.48	.18
Child's progress	3.3	(.5)	26	3.1	(.6)	23	.38	-.43
POSTTEST #2								
• Test of parent knowledge[$]	15.0	(5.9)	20	19.1	(4.8)	17	.03	.69
• Parent rating of educational[*] services								
Staff	3.5	(.6)	19	3.5	(.7)	21	.81	.00
Communication	3.7	(.6)	19	3.4	(.8)	20	.08	-.54
Child's goals/activities	3.5	(.5)	19	3.4	(.5)	21	.78	-.20
Opportunity to Participate	3.6	(.6)	19	3.7	(.5)	21	.61	.16
Range of services	3.0	(.7)	19	3.2	(.8)	21	.43	.30
Program in general	3.5	(.5)	19	3.4	(.9)	21	.84	-.20
Child's progress	3.5	(.5)	20	3.5	(.8)	19	.86	.00
POSTTEST #4								
• Test of parent knowledge	14.8	(6.1)	27	17.4	(6.3)	24	.14	.43

[$] All parents took a test based on the PIE curriculum that was taught to the parent involvement group. Higher scores indicate more correct answers.

[*] Data are based on Parent Satisfaction Questionnaire Scores (range 1-4). Higher scores indicate better ratings.

[^] $$\text{ES} = \frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

groups were similarly satisfied with the services with average ratings of almost 3.5 in each group. The only statistically significant ($p \le .10$) differences[1] were that at Posttest #1, soon after the PIE instruction was completed, parents in the parent involvement group were more satisfied with their opportunity to participate (p = .09) and at Posttest #2, the comparison group rated their ability to communicate with program staff higher (p = .08).

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[1] *As discussed further in the Results section, alpha for all statistical tests was set at* $p \le .10$ *in order to increase statistical power and balance Type I and Type II errors.*

Interviews conducted with parents at the time of the second posttest revealed that almost all were satisfied with the center-based services they received. Only one parent of the 40 interviewed reported leaving the center's intervention program because of dissatisfaction with the services. Several reported problems with transportation (6 parents) or scheduling of the child's classes (3 parents). The most frequently cited service mentioned as most helpful by these parents was speech therapy.

Parents who participated in the PIE program were asked specific questions about their classes. (Seventeen parents completed these questionnaires.) The majority (14) of these 17 parents found the center-based program more valuable than the PIE instruction. However, most reported less stress in their lives after the instruction (11) or no change in stress (2 parents). Fourteen of the 17 parents reported that they felt the PIE program positively influenced their interactions with their children, with these parents claiming greater objectivity and more effective use of reward and punishment. Fifteen of the 17 parents were satisfied with the parent-involvement package and the information provided. Of the two parents who did not report satisfaction, one was indifferent towards the program and attributed her indifference to her poor attendance (which was due to scheduling conflicts). The other parent did not feel the information was useful.

Treatment effects could be influenced by using more than one PIE instructor. Instructor effects have been previously noted in the parent involvement research literature (Hoover-Dempsey, Bassler, & Brissie, 1987). Therefore, an additional analysis was completed on the posttest data which compared the effect of parenting group instructor on outcome measures for the parenting group. (Two instructors taught the parent workshops; one had one class of 9 parents while the other had two classes which also consisted of 9 parents each.) Table 9.4 presents these results. No statistically significant effect due to instructors was evident on child or family functioning measures. Thus, having different instructors for the PIE instruction did not appear to have affected the comparison of treatment intervention.

Table 9.4

Comparisons of Effect Due to Instructor at Posttest #1 in the 1986 Parent Involvement Study

	Center-Based Program			Center-Based + PIE			p Value
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	
• Battelle Total (DQ)	56.45	14.3	9	66.02	14.5	18	.12
• CES-D (depression)	29.33	5.68	9	35.44	13.73	18	.22
• PSI--Total	245.89	32.38	9	259.89	44.27	18	.41
• PSI--Child	114.67	18.90	9	122.61	17.07	18	.28
• PSI--Other	131.22	14.26	9	137.28	28.75	18	.47
• FACES--Adapt	3.89	2.37	9	5.50	6.73	18	.37
• FACES--Cohesion	6.22	9.43	9	8.22	7.16	18	.54
• FACES--Total	10.11	8.77	9	13.72	11.63	18	.42

A structured site visit during the initial year of the project was conducted by the research staff to make sure that the interventions were occurring as planned. The results of that site visit (a detailed report of which is available from EIRI) found that all the children participated in essentially the same center-based program, with the major difference being that the parents of the children in the parent involvement group received the additional parent involvement component and the parents of the children in the other group did not.

The treatment verification procedures described above were useful to decide whether the alternative intervention programs were delivered as planned. Knowing that the interventions differed in the ways intended increases our confidence that differences in outcomes, if found, are likely related to the differences in treatment and not to other factors. In a study such as this one it is also important to ascertain whether other historical factors occurred outside of the treatment which might have affected the results. A discussion of these follows.

Contextual Factors

The alternative early intervention programs under investigation were not the only factors which could have influenced the development of these children or the functioning of their families. Other factors, such as the health of the children, changes in the family's living situations, the families' resources, and other family stresses all might have influenced child development and family functioning. Additionally, other intervention services the parents may have purchased might have affected the outcome scores. To the degree that these contextual factors are equal for children in both groups, differences in outcomes can be more confidently attributed to the differences between the treatments. However, if there are differences in these contextual factors for children in each of the groups, we cannot be sure whether those differences are the result of differences in treatments or the differences in the contextual factors. Therefore, a concerted effort was made to monitor the effects of important contextual factors as described below.

Annually the parent completed a demographic survey of their present living situation and a child health survey. Key demographic factors that are subject to change are listed in Table 9.5. Throughout the posttests, the parent involvement group included more families in which both mother and father were present in the home and more children needing special education service than did the center-based group, echoing the pretest differences. The mean income of the two groups increased over time, but remained comparable to each other across posttests. Mothers in the center-based group did tend to work more hours per week than did the mothers in the parent

Table 9.5

Comparison of Contextual Variables for Center-Based and Parent Involvement Groups for 1986 Utah Parent Involvement Study

Center-Based Program	Center-Based + PIE						p**	
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	Value	ES^
POSTTEST #1								
• **Child Health**	1.9	(.7)	28	1.9	(.7)	27	.68	.00
• **Demographics**								
Child living w/mother & father	.8	(.4)	26	1.0	(.0)	23	.03	.50
Mother's employment hrs/week	9.1	(14.1)	24	3.9	(8.6)	22	.13	-.37
Annual Income	$21,961	($12,689)	26	$22,956	($13,642)	23	.79	.08
Siblings receiving special education services	.1	(.3)	25	.6	(.8)	23	.01	1.67
• **Family Variables**								
Family Resources (FRS)&	112.4	(23.6)	28	111.3	(19.1)	28	.85	-.05
Family Life Events (FILE)&	10.7	(7.6)	28	12.1	(6.7)	28	.47	.18
• **Additional Services**								
Speech Therapy % receiving 1 hr/ month or more	7.1		28	10.7		28	.65	.10
Physical/Occupational Therapy % receiving 1 hr/month or more	7.1		28	10.1		28	.65	.10
Daycare % received less than 5 hrs/week	100.0		28	89.0		28	.40	-.36
• **DDI Teacher Rating of Parents$**								
Attendance	2.6	(.8)	26	2.8	(.4)	24	.24	.25
Support	2.3	(1.0)	26	2.5	(.6)	24	.40	.20
Knowledge	2.2	(1.0)	26	2.6	(.5)	24	.07	.40
POSTTEST #2								
• **Child Health**	1.9	(.6)	19	2.0	(.6)	21	.75	.17
• **Demographics**								
Child living w/mother & father	.8	(.4)	21	1.0	(.0)	18	.03	.50
Mother's employment hrs/week	8.5	(15.6)	20	2.6	(6.4)	19	.13	-.38
Annual Income	$23,785	($15,895)	21	$25,631	($12,029)	19	.68	.12
Siblings receiving special education services	.2	(.5)	21	.8	(1.0)	19	.04	1.20
• **Family Variables**								
Family Resources (FRS)&	115.9	(22.7)	21	114.0	(19.2)	20	.77	-.08
POSTTEST #3								
• **Demographics**								
Child living w/mother & father	.8	(.4)	26	1.0	(1.0)	24	.10	.50
Mother's employment hrs/week	9.9	(15.5)	26	4.5	(8.5)	24	.13	-.35
Annual Income	$25,923	($15,052)	26	$25,458	($13,299)	24	.91	.81
Siblings receiving special education services	.2	(.5)	26	.8	(1.1)	24	.02	1.20
• **Family Variables**								
Family Resources (FRS)&	117.5	(20.8)	26	117.8	(15.8)	24	.96	.01

(continued)

^ $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

** The p value and ES are based on comparison of study status (i.e., in study, those who were tested at the posttest versus out of study, those who were not tested at that posttest). The sign of ES only indicates direction of difference; no value judgment is intended.

$ Data are based on teacher rating of parents' attendance, support, and knowledge range (1-3). Higher scores indicate better ratings.

& Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for the FILE are based on raw scores. Lower scores represent less stress and are considered better.

Annually, parents completed an additional services form which described other types of intervention or additional services the child and family received. At Posttest #5, this was replaced with an interview.

Table 9.5 (continued)

Comparison of Contextual Variables for Center-Based and Parent Involvement Groups for 1986 Utah Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p** Value	ES^
POSTTEST #4								
• **Child Health**	2.0	(.5)	28	2.1	(.7)	24	.60	.20
• **Demographics**								
Child living w/mother & father	.8	(.4)	28	.8	(.4)	23	.79	.00
Mother's employment hrs/week	12.6	(17.6)	25	5.1	(9.3)	22	.07	-.43
Annual Income	$27,038	($16,617)	26	$26,478	($17,045)	23	.91	-.03
Siblings receiving special education services	.2	(.5)	28	.8	(1.1)	23	.01	1.20
• **Family Variables**								
Family Resources (FRS)&	118.5	(17.9)	28	115.4	(18.1)	24	.54	-.17
• **Additional Services**								
Speech Therapy % receiving 1 hr/ month or more	0		28	0		23	1.00	0
Physical/Occupational Therapy % receiving 1 hr/month or more	0		28	0		23	1.00	0
Daycare % received less than 5 hrs/week	100		28	100		23	1.00	0
POSTTEST #5								
• **Child Health**	2.0	(.5)	28	2.1	(.7)	25	.50	.20
• **Demographics**								
Child living w/mother & father	.8	(.4)	26	1.0	(.2)	25	.09	.50
Annual Income	$29,537	($13,975)	27	$32,160	($19,048)	25	.57	.19
Siblings receiving special education services	1.1	(.4)	28	1.5	(.8)	25	.01	1.00
• **Family Variables**								
Family Resources (FRS)&	115.3	(20.0)	28	119.1	(16.8)	24	.46	.19
Family Stress (Holmes-Rahe)+	149.5	(94.1)	28	199.6	(152.4)	24	.15	.53
Family Negative Events+ (Holmes-Rahe)	35.9	(48.2)	28	37.2	(51.5)	24	.92	.03
• **Additional Services#**								
Speech Therapy % receiving 1 hr/ month or more	3.6		28	20.0		25	.07	.45
Physical/Occupational Therapy % receiving 1 hr/month or more	17.9		28	16.7		25	.59	-.04
Total School Hours	1,140.1	(188.2)	28	1,156.8	(86.5)	25	.68	.11

^ $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

** The p value and ES are based on comparison of study status (i.e., in study, those who were tested at the posttest versus out of study, those who were not tested at that posttest). The sign of ES only indicates direction of difference; no value judgment is intended.

$ Data are based on teacher rating of parents' attendance, support, and knowledge range (1-3). Higher scores indicate better ratings.

& Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for FILE are based on raw scores. Lower scores represent less stress and are considered better.

Annually, parents completed an additional services form which described other types of intervention or additional services the child and family received. At Posttest #5, this was replaced with an interview.

+ Analyses for the Holmes-Rahe are based on raw scores. For both family stress and negative events lower scores represent less stress and are considered better.

involvement group, but the difference was only statistically significantly different (p = .07) at Posttest #4.

As part of the annual child health questionnaire, parents compared their children's general health to other children on a scale of "1" (poor health in comparison to others) to "3" (better health in comparison to others). The mean scores and standard deviations across posttests indicate that the health of the children in the two groups was very similar and that most of the children had average health when compared to other children.

Perceptions concerning the family's resources was obtained annually via the Family Resource Scale (FRS). Other stressors which may have effected child or family functioning were measured at Posttest #1 by the Family Inventory of Life Events (FILE) and at Posttest #5, by the Holmes-Rahe Social Readjustment Rating Scale (SSRS). (A more complete description of these scales is presented later.) The scores for the two groups remain very comparable across the posttests for both family resources and other stresses.

Other intervention obtained by the parent for the child might influence the child's development. Parents reported additional services their child received during the previous year at Posttests #1, #4, and #5. More than 75% of the families did not report any additional speech therapy, or physical or occupational therapy. At no posttest did one group receive statistically significantly more additional services than did the other.

The degree to which the parent is committed to, supportive of, and knowledgeable about the child's intervention program might also influence the child's development. A description of quality of parent involvement was also gathered at Posttest #1 from the intervener who worked most closely with the child's mother. The data obtained was the intervener's perception (low[1], average[2], high[3]) of how a parent rated on attendance, knowledge, and support. In general, teachers rated the parents in the parent involvement group slightly higher than parents in the center-based group. Of the three areas in which ratings were done, only knowledge was statistically significant higher (p = .07) which is exactly what one would expect given the additional instruction parents in this group were receiving. While the mean ratings for these variables tended to be high (2.62 for attendance, 2.40 for knowledge, and 2.42 for support), nearly half the sample ranked as low or average on one or more of these categories, indicating that interveners were discriminating in the ratings they applied. These intervener ratings of the parents are typical of the situations experienced by many early intervention professionals who work with parents (Lochman & Brown, 1980).

In sum, except for "number of parents in the home" and "other siblings needing special education services," consistent statistically significant differences of contextual factors between the two groups were not found. Thus, the influence of these contextual factors on the outcome measures of child development and family functioning would appear to be comparable for both the center-based and parent involvement groups.

Cost of Alternate Programs

It is important to determine the cost of adding any type of a parent involvement component to an already established center-based program. Should costs be high and relative benefits be low, money used to establish a parent program might be better spent elsewhere. Haskins and Adams (1982) point out that there is a great need for cost analysis in the area of parent education to provide evidence that such programs will justify their costs by increasing the productivity of parents, their children, or both, and/or reduce the necessity for larger investments in treatment programs at some later date. This study has addressed these issues in part, and will provide more conclusive answers as it follows these children through their school years.

The cost of the basic center-based program and the center-based plus PIE program as described above was determined using the ingredients approach advocated by Levin (1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs. It includes costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, transportation, materials and supplies, miscellaneous, and contributed resources. The cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each program. Table 9.6 shows all costs after they were adjusted for inflation to 1990 dollars. In addition, at the bottom of the table, the figures are discounted at 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to each program. Occupancy charges included the annual rent for the two facilities in which the program was housed, and all utilities, insurance, and maintenance costs. Equipment costs were based on estimates of the market replacement value of all equipment owned by the center, annualized to account for interest and depreciation. In addition, the cost of rental and maintenance of other equipment not owned by the center was determined. Transportation costs were paid by the center for staff home visits, workshop attendance, and errands as well as the costs of bringing low-income children into the center. Transportation costs for all other children were assumed by their parents and are included under "contributed resources." The cost for materials and supplies and miscellaneous included the annual expense to the program for all consumable items and miscellaneous expenses incurred by each program.

Table 9.6

Cost Per Child for the 1986 Utah Parent Involvement Study (1990 Dollars)

Resources	Center-Based Program (n = 174)	Center-Based + PIE (n = 29)
Undiscounted		
Agency Resources		
Direct Service	$3,153	$3,334
Administration	608	640
Occupancy	694	694
Equipment	89	89
Transportation		
Children	10	10
Staff	7	7
Materials/Supplies	51	58
Miscellaneous	30	30
SUBTOTAL	**$4,642***	**$4,862***
Contributed Resources		
Volunteer time	25	25
Parent time	416	1,208
Parent Transportation	1,306	1,383
Miscellaneous	2	2
Subtotal	**$1,749**	**$2,618**
Total	***$6,391****	***$7,480****
Discounted (3%)		
Agency Resources	$5,071	$5,312
Total Resources	**$6,984***	**$8,171***
Discounted (5%)		
Agency Resources	$5,373	$5,627
Total Resources	**$7,398***	**$8,657***

* *Totals may not add up due to rounding errors.*

Contributed resources included the value of volunteer and parent time. Community members contributed 426 hours during the year to the program. Based on actual attendance data, the average parent in the PIE group spent approximately 13 hours in instructional sessions. Assuming that parents followed PIE curriculum requirements, parents also spent about 67 hours working at home with their child. In addition, parents in both groups provided transportation for their children. The cost of child transportation was estimated based on information provided by parents via telephone interview. All volunteer time in the program was assigned the opportunity cost of $9 per hour. This amount was based on the "median usual weekly earnings for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989). Finally, contributed miscellaneous resources included the market value of a computer donated to the program.

Table 9.6 presents results which demonstrate that the addition of this type of parent involvement is fairly inexpensive. On the average, the addition of parent instruction to the center-based program only costs about $200 more per child in direct costs to the center. This is mostly due to increased personnel costs, although a small amount goes to supplies. However, when the value of contributed resources is added in, this difference is approximately $1,000, reflecting the addition of the parents' time. Although the addition of this type of a parent involvement program (e.g., PIE) is fairly inexpensive in actual dollars for an already-established center-based program, there is a substantial cost to participating parent in terms of their time. The question of the relative effectiveness of the parent involvement will be addressed in the results section.

Data Collection

Data collection procedures involved the recruitment, training, and monitoring of diagnosticians, and administration of measures at pretest and posttests. The measures used to obtain data on the children and their families and the posttests at which they were used are listed in Table 9.7. Descriptions of the measures are presented in Table 9.8.

Recruitment, training, and monitoring of diagnosticians. With the exception of one BDI tester, this project used the same diagnosticians for pretest, Posttest #1, and Posttest #2. All of the diagnosticians had Master's degrees and extensive experience assessing infants and children with disabilities. In addition, two of the three testers were enrolled in special education doctoral programs. All were trained through a lengthy process which involved approximately 4 hours of independent study, 8 hours of group training, and a minimum of 3 practice administrations. To be certified, an 85% interrater agreement was required.

Table 9.7

Schedule of Administration of Measures for Utah 1986 Parent Involvement Study

	Pretest	Posttest #1	Posttest #2	Posttest #3	Posttest #4	Posttest #5
CHILD MEASURES						
Battelle Developmental Inventory	X	X	X	X	X	
Developmental SPECS					X	X
Minnesota Child Development Inventory		X				
Child Health		X	X		X	X
Woodcock-Johnson Tests of Achievement--Revised						X
The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children						X
Scales of Independent Behavior						X
Social Skills Rating System (Parent Form)						X
Social Skills Rating System (Teacher Form)						X
FAMILY MEASURES						
Parent Stress Index	X	X	X	X	X	
Family Support Scale	X	X	X	X	X	X
Family Resource Scale	X	X	X	X	X	X
Family Inventory of Life Events and Changes	X	X				
Family Adaptation and Cohesion Scale	X	X	X	X	X	
CES-D Depression Scale		X				
Child Improvement Questionnaire-Revised		X	X			
Peabody Picture Vocabulary Test	X[a]					
Parent-Child Interaction		X	X		X	
Public School Teacher Evaluation			X		X	X
Additional Services		X			X	X
Parent Self-Awareness Scale						X
Social Readjustment Rating Scale						X
Comprehensive Evaluation of Family Functioning						X
Family APGAR						X

[a] Given at Posttest #1, but actually a part of the pretest.

Table 9.8

Description of Tests Administered for Utah 1986 Parent Involvement Study

MEASURES	DESCRIPTION
CHILD MEASURES	
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses Personal/Social, Adaptive, Motor, Communication, and Cognitive Skills, and provides a total score.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: Communication, Sensorimotor, Physical, Self-Regulation, Cognition, and Self-Social.
Minnesota Child Development Inventory (MCDI) (Ireton & Thwing, 1974)	Assesses mother's perception of child development in eight areas: General Development, Gross Motor, Fine Motor, Expressive Language, Comprehension-Conceptual, Situation Comprehension, Self Help, and Personal-Social
Child Health (E.I.R.I.)	Assesses the parents evaluation of the child's health during the past year, including general health, illnesses, hospitalization, etc.
Woodcock-Johnson Tests of Achievement--Revised (WJ-R) (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of six aspects of scholastic achievement: Letter-Word Identification, Applied Problems, Dictation, Science, Social Studies, and Humanities. Child is the respondent.
The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1983)	Assesses a child's perceived competence and social acceptance in four specific domains: Cognitive Competence, Physical Competence, Maternal Acceptance, and Peer Acceptance. Child is the respondent.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1985)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: Motor Skills, Social and Communication Skills, Personal Living Skills, and Community Living Skills. Parent is interviewed for information.
Social Skills Rating System --Parent Form (PSSRS) (Gresham & Elliot, 1990)	The PSSRS measures the parent's estimate of the child's social skills such as: Control, Assertion, Responsibility, and Self-Control. Problem behaviors that are also assessed are: Externalizing, Internalizing, and Hyperactivity.
Social Skills Rating System --Teacher Form (TSSRS) (Gresham & Elliot, 1990)	The TSSRS measures the teacher's estimate of the child's social skills such as: Control, Assertion, and Self-Control. Ratings of problem behaviors (Externalizing, Internalizing, and Hyperactivity) and academic competence are also assessed.
FAMILY MEASURES	
Parenting Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors and parent factors.
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: Intra-Family, Martial, Pregnancy and Childbearing, Finance and Business, Work-Family Transitions, Illness and Family "Care," Losses, Transitions "In and Out," and Legal.

(continued)

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Table 9.8 (continued)

Description of Tests Administered for Utah 1986 Parent Involvement Study

MEASURES	DESCRIPTION
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations.
CES-D Depression Scale (Radloff, 1977)	This scale is a short self-report test designed to measure depression-symptomatology on the general population.
Child Improvement Questionnaire--Revised (Devellis, Revicki, & Bristol, 1985)	The questionnaire has been adapted from the Child Improvement Locus of Control (CILC). The CILC assesses parental perceptions of factors that affect the progress of their developmentally impaired child. Factors assessed are: chance, efforts by professionals, the child's efforts, parent efforts, and divine intervention.
Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 1981)	Measures the vocabulary of the mother. The score correlates highly with the mother's IQ.
Test of Parent Knowledge (E.I.R.I.)	Assesses parent's knowledge of PIE curriculum. Includes 30 multiple-choice questions.
Parent/Child Interaction (E.I.R.I.)	15 to 20 minute videotape of parent-child interaction following a set protocol devised by EIRI.
Additional Services (E.I.R.I.)	Provides data on services the child and family have received during the past year outside the study (e.g., Schooling, Early Intervention, Speech Therapy, Physical and Occupational Therapy, Tutoring).
Parent Self-Awareness Scale (PSAS) (Snyder, Weeldreyer, Dunst, & Cooper, 1985)	The PSAS is a 20-item questionnaire that measures the parent's perceived level of personal capabilities, decision-making capabilities, and informational capabilities.
Social Readjustment Rating Scale (SRRS) (Holmes & Rahe, 1967)	The SRRS measures parental stress by assigning numerical values to various positive and negative life events occurring within the last year. A separate score of the occurrence of major negative events is also provided.
Comprehensive Evaluation of Family Functioning (CEFF) (McLinden, 1990)	The CEFF examines areas in which a family of a child with special needs may be effected: Time Demands, Acceptance, Coping, Social Relationships, Financial Demands, Well-being, and Sibling Relationships. It is a parent self-report measure using a Likert-type scale format.
Family APGAR (Smilkstein, 1978)	The family APGAR assesses five functional components of family life by presenting five statements to which the parent responds using a Likert-type format. Family functions include: Adaptability, Partnership, Growth, Application, and Resolve.

At Posttest #3, #4, and #5, new testers were trained. All were graduate students or professionals in special education or language therapy and were experienced testers. All had worked extensively with children. At Posttest #5, all diagnosticians (including those who had been previously certified and those in the process of certifying) attended a workshop reviewing procedures, scoring, etc.

Although these diagnosticians were aware that research was being conducted, they were "blind" to the specific details, hypotheses, and group membership of participants in the study. Shadow scoring was conducted on 10% of BDI or WJ-R and SIB administrations. Average reliability scores always exceeded 90%. In addition to the shadowscoring, each scored test protocol was reviewed by a clerk. Quality control checklist protocols were prepared for and sent to each tester. On the checklist, each protocol the tester had administered was listed, and any errors (e.g., basal, ceiling, addition) were noted.

Pretest. Pretesting took place in late October and early November of 1986. Parents of each child participating in the study completed an informed consent form and were interviewed concerning demographic information. In the first of two pretesting sessions, children were administered the Battelle Developmental Inventory (BDI). Testing occurred at the center. In a second pretesting session, which usually took place within two weeks of the BDI test session, parents (usually the mother) completed the following family measures: the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Inventory of Life Events and Changes, and the Family Adaptability and Cohesion Scales. Information pertaining to the reliability and validity of these measures may be found in the first annual report (White & Casto, 1985). Each of these two sessions lasted approximately 1½ hours. Parents were paid a $20 incentive after both pretesting sessions were completed.

Posttest #1. Initial posttesting occurred at the end of the school year during the last two weeks of May and the first week of June 1987, or approximately 7.5 months after pretesting occurred. The posttest battery took three test sessions to administer. The posttest battery consisted of the same battery of tests and surveys as the pretest battery as well as some additional measures. For mothers, the additional tests and surveys included the CES-D Depression Scale, a survey of child health, the Child Improvement-Questionnaire--Revised, a test of knowledge regarding

PIE curriculum, a satisfaction with educational services questionnaire, and the Peabody Picture Vocabulary Test. (Although the PPVT was given at Posttest #1, it was included with the pretest measures as another initial comparison measure, reasoning that attending PIE instruction would not affect the scores.) Mothers also completed the Minnesota Child Development Inventory (MCDI), an additional measure of the child's developmental level as perceived by the mother. The posttest BDI and PPVT were administered by the trained diagnosticians. Parents were paid a $40 incentive for completing the posttest battery. Additionally, mother/child interaction was videotaped for 16 minutes using a standardized protocol, and mothers were paid $10 for the videotaping session.

Posttest #2. A second posttest was conducted on both treatment groups in June, 1988. No monitoring of parental implementation of training principles took place between the first and second posttesting. Parents were contacted via telephone and appointments were made for both parents and their child(ren) to complete the core measures. The children were administered the BDI while parents filled out various family measures. In addition to family measures, parents in both treatment groups again completed the questionnaire assessing the parents' satisfaction with the preschool educational services and a test of knowledge regarding PIE curriculum.

All parents were interviewed and were given the opportunity to comment on services received at the center. The parents who had received the PIE instruction were asked to discuss their attitudes, knowledge, and satisfaction with the instructional program. They were also asked to discuss how their parenting techniques had changed as a result of the PIE, as well as how they handled stressful parenting. Parent-child interaction was again videotaped. After the completion of both the BDI and parental measures and interviews, parents were compensated $30 for their time.

For those few children (12) who were already in public school, permission was obtained to contact the teachers of study participants. These teachers were asked to complete a questionnaire designed to ascertain teachers' impressions of parent's knowledge of their child's program and progress in comparison with other parents. This questionnaire also gathered information on the child's classification, school attendance, classroom placement, tests administered, teacher certificates held, and teacher's recommendation for the child's future placement. As an incentive for teachers to participate, two posters appropriate for classroom use were mailed with the questionnaire. This questionnaire had a 100% return rate.

Posttest #3. A third posttest was taken during the summer of 1989. Procedures for this posttest were similar to that of the second posttest. Parents were contacted via telephone and appointments made for parents and their children to complete the core measures. Assessments were conducted at a local community college and a nearby preschool. The children were administered the BDI while parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Adaptability and Cohesion Scales, and a demographic survey. Testing sessions lasted approximately two hours and parents were paid $35 for their participation.

Posttest #4. The procedures for the testing at Posttest #4 remained the same. The parents were contacted by letter in January, 1990, informing them of the schedule for testing and encouraging their participation. Permission to contact the school teachers, and the teacher's name and school of their children were also requested. Most of the testing took place at a special education center in the Salt Lake City area with a few children (primarily for those living out of state) being tested in their homes. Most of the testing was completed in April with some being done in May, June, and July.

Most of the measures used were the same as were used previously. Videotaping of parent-child interaction was also completed, using the standardized protocol that was used at Posttests #1 and #2. The length of the taping was increased to 20 minutes and toys appropriate for older children were included. The testing session lasted approximately 2½ hours and parents were paid $50 for the family's participation.

The public school teachers also completed measures of child development, using the Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1989). This measure asks the teacher to rate the child's development in 19 areas using Likert-type scales with the possible scores ranging from 1 to 5. On these scales a score of 5 signifies that the child's behavior is typical of behavior of most of the children of the same age, and a score of 1 signifies severe problems or very atypical development in that area. The teachers also completed a questionnaire describing the children's present educational program and evaluating the parents' participation in the children's education. Teachers were again sent classroom posters to thank them for their participation. At this time, the children were attending 32 different elementary schools. It is highly unlikely that the present public school teachers would be aware of the parent involvement component of the intervention program which had transpired over three years before.

Posttest #5. The procedures for testing at Posttest #5, including the contacting, scheduling, and place for testing, length of testing and payment were the same as those at Posttest #4. Most of the testing was completed in April with some being done in March and May.

Many of the measures used changed during Posttest #5. The Woodcock-Johnson Revised Test of Achievement (WJ-R) and the Scale of Independent Behaviors (SIB) replaced the Battelle Developmental Inventory (BDI) because during Posttest #4, a number of children in the study were approaching the ceiling of the BDI. A measure of child self-concept, the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1983) was used. The Pictorial Scale of Perceived Competence and Social Acceptance provides two measures of self-perceived competence (cognitive and physical) and two measures of self-perceived social acceptance (by peers and by mother). This measure was too difficult for some of the subjects; hence 41 subjects completed the measure. A measure of child social skills as perceived by mother and teacher (Social Skills Rating System (SSRS), Gresham & Elliot, 1990) was also used. The family parenting stress measures (PSI) and family functioning measure (FACES III) were not used this year. A new measure of family functioning for families of children with special needs (Comprehensive Evaluation of Family Functioning (CEFF), McLinden, 1990), a measure of general family functioning (Family APGAR, Smilkstein, 1978), a measure of family stress and readjustment (Social Readjustment Rating Scale (SRRS) Holmes & Rahe, 1967, and a measure of parent self-awareness (Parent Self Awareness Scale PSAS), Snyder et al., 1985) were also used.

The present school teachers were again asked to complete the Developmental SPECS, a measure of child development, along with the social skills rating scale, and a questionnaire describing the child's present educational program and evaluating the parents' participation in the children's education. Gift certificates to a school supply store were sent to the teachers to thank them.

Results and Discussion

The primary question that these analyses sought to answer is: What are the immediate and long-term effects on the functioning of participating children and families of adding one type of parent involvement component to an existing center-based early intervention program? Additionally, the following question was addressed: Is the magnitude of the effect on children's and families' functioning associated with the degree of parental participation?

The first question is addressed by comparing two groups, the center-based group and the parent involvement group, on child outcome measures first, and then on family functioning measures. The second question is addressed by comparing the group of parents in the parent involvement group who attended 11 or more of the PIE sessions with the center-based group. This will be called the participation comparison. For each question, child outcomes will be discussed first, followed by the family functioning outcomes.

The degree to which these questions can be answered definitively depends in part on whether the groups are comparable at pretest. This issue will be addressed first, followed by the results of the analyses concerning differences between the groups at the various posttests.

Comparability of Groups on Pretest Measures

As was noted in the section on demographic characteristics, the two groups were very comparable (refer back to Table 9.1); the groups were different only on the number of children living with both parents and the number of families having other children with disabilities.

The two groups were also very comparable on the pretest measures. As can be seen in Table 9.9, there were no statistically significant differences on child development or family measures. P-values range from .97 to .15 and the effect sizes are small. The children had an average developmental quotient of 58, which would be considered moderately retarded. The parents were experiencing significant child-related stress (measured by the PSI) with average child-related stress ranking at the 88th percentile (compared to PSI norms). The parents evaluated their resources (FRS scale) a little lower than average and their support (FSS scale) a little higher than average when compared to all the parents (over 900) in the EIRI Longitudinal Data Set. The parents also felt they had experienced a fair number of disrupting

Table 9.9

Comparison on Pretest Measures of Center-Based and Parent Involvement Groups in the 1986 Utah Parent Involvement Study

	Center-Based Program				Center-Based + PIE					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES^
• **Battelle Developmental Inventory (BDI)**[*]										
Personal Social	85.6	(27.7)		28	85.3	(30.6)		28	.97	-.01
Adaptive Behavior	54.0	(14.2)		28	55.9	(16.5)		28	.64	.13
Motor	69.8	(22.7)		28	75.4	(24.4)		28	.38	.25
Communication	37.8	(13.7)		28	39.4	(15.3)		28	.68	.12
Cognitive	30.0	(8.9)		28	31.8	(12.7)		28	.55	.20
TOTAL	277.2	(73.1)		28	287.8	(85.7)		28	.62	.15
• **Parenting Stress Index**[♦] **(PSI) Percentile Rank**										
Child Related (range 47 to 235)	122.7	(23.5)	90	28	117.3	(17.7)	86	27	.34	.23
Other Related (range 54 to 270)	131.7	(30.5)	70	28	137.6	(20.1)	76	27	.40	-.19
TOTAL (range 101 to 505)	254.4	(48.7)	83	28	254.9	(34.2)	83	27	.97	-.01
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**										
Adaptability (range 0 to 50)	5.0	(2.9)		28	4.6	(2.7)		27	.58	-.14
Cohesion (range 0 to 50)	5.5	(6.2)		28	3.7	(2.2)		27	.15	-.29
• **Family Resource Scale (FRS)**[$]	114.5	(18.2)	42	28	112.5	(18.3)	40	26	.70	-.11
• **Family Support Scale (FSS)**[$]	28.5	(11.4)	52	26	30.0	(9.7)	59	25	.62	.13
• **Family Index of Life Events**[♦] **(FILE)**	11.4	(6.8)	31	28	11.8	(6.1)	30	26	.82	-.06

[*] Statistical analyses for the BDI were conducted using raw scores and these are presented in the table.

[$] Analyses for the FSS and FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

[♦] Analysis for PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, high percentiles on the FILE represent fewer stressful events.

$$\hat{} \; ES = \frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

events. (Life events are measured by the FILE for which national norms are available; a low percentile indicates more disruption and stress.)

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Selection of covariates. The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. (Analyses other than analyses of covariance are described as such in the text and/or table.) Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. Even though subjects were randomly assigned to groups, analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis.

All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $p \leq .10$, and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977), in those cases where a covariate or set of covariates could be found which correlated at least .60 with the dependent variable in question (which was almost the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 81% for finding moderate sized differences (defined by Cohen as differences of a half a standard deviation). For Posttests #1 and #2, since the covariates correlated more highly with the dependent variables, the statistical power was even higher.

Posttest #1 group comparisons. The results of the BDI and the Minnesota Child Development Inventory (MCDI) at Posttest #1 (approximately two months after the PIE instruction was completed) demonstrate that the two groups were developmentally very comparable. Only one statistically significant difference was found out of 14 scores (refer to Table 9.10). On the personal-social domain of the BDI, the children in the parent involvement group scored higher than the children in the center-based group. Other than this one difference (which may have been a chance occurrence), there is no clear cut developmental advantage for either group. The parent involvement group had higher adjusted means for more of the BDI scores, but the center-based group had higher adjusted means for more of the MCDI scores.

Posttest #2, #3, and #4 group comparisons. The findings for Posttests #2, #3, and #4 were somewhat different than were the Posttest #1 findings. At Posttests #2, #3, and #4, the children in the parent involvement group performed statistically significantly better on the total BDI than did the children in the center-based group (see Table 9.10). They also scored higher on all the domain scales across these three posttests, with the differences for the domains of personal-social development at Posttests #3 and #4, and cognitive development at Posttests #2 and #3 being statistically significant. The effect size of these differences increased from posttest to posttest.

Table 9.10

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups (Posttests #1-#5) in the 1986 Utah Parent Involvement Study

Variable	Covariates[$]	Center-based only $\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	Center-based + PIE $\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
POSTTEST #1												
• **Age in months at Posttest #1[@]**	--	50.0	(10.5)		28	48.6	(10.6)		28	.24	.62	-.13
• **Battelle Developmental Inventory (BDI) Raw Scores for:[*]**												
Personal-Social	1,5,7	87.3	(28.0)	88.4	28	98.5	(29.8)	97.4	28	4.09	.05	.32
Adaptive Behavior	2,3,7	56.7	(15.4)	58.1	28	61.6	(17.2)	60.2	28	.89	.35	.14
Motor	3,7	77.4	(23.9)	80.7	28	83.1	(28.5)	79.8	28	.15	.70	-.04
Communication	4,5,7	44.0	(16.4)	45.7	28	46.0	(19.6)	44.3	27	.52	.47	-.09
Cognitive	4,5,7	34.3	(13.7)	35.4	28	38.3	(15.8)	37.2	28	.78	.38	.13
Total	6,7	298.9	(81.6)	306.6	28	327.3	(92.3)	319.7	28	2.27	.14	.16
• **MCDI[&]**												
General Development	6	28.6	(9.5)	29.8	28	30.2	(8.9)	29.0	27	.08	.78	-.08
Gross Motor	3	23.1	(9.2)	24.8	28	25.8	(9.7)	24.1	27	1.45	.23	-.08
Fine Motor	2, 3	31.5	(13.2)	33.2	28	34.5	(8.9)	32.7	27	.64	.54	-.04
Expressive Language	4	27.8	(10.2)	28.8	28	28.4	(10.1)	27.4	27	.49	.49	-.14
Comprehension Conceptual	5	30.9	(10.5)	31.9	28	34.1	(13.8)	33.1	27	.12	.74	.11
Situation Conceptual	6	31.0	(14.3)	32.4	28	31.7	(13.4)	30.3	27	.69	.41	-.15
Self-Help	2	57.9	(17.8)	31.6	28	65.0	(12.0)	31.5	27	.00	.96	-.01
Personal-Social	1	25.8	(7.0)	26.1	28	28.5	(9.4)	28.1	27	.61	.44	.29
POSTTEST #2												
• **Age in months at Posttest #2[@]**	--	1.4	(11.9)		20	60.6	(11.6)		20	.05	.83	-.07
• **Battelle Developmental Inventory (BDI) Raw Scores for:[*]**												
Personal-Social	4,5,7,8	101.7	(23.9)	104.5	20	111.1	(19.6)	108.3	19	.90	.35	.16
Adaptive Behavior	2,3,7	67.4	(15.7)	69.0	20	72.6	(12.1)	71.0	20	.46	.50	.13
Motor	3,7	92.4	(20.5)	95.9	20	102.5	(24.3)	99.0	20	.85	.36	.15
Communication	4,5,7	50.4	(17.7)	52.3	20	56.1	(17.1)	54.1	20	.26	.61	.10
Cognitive	4,5,7	41.4	(16.2)	43.5	20	51.0	(18.0)	48.9	20	2.78	.10	.33
Total	6,7	353.2	(76.5)	362.1	20	394.5	(72.5)	385.5	20	4.08	.05	.31

(continued)

[#] Covariance adjusted means

[*] Statistical analyses for the BDI were conducted using raw scores and these are presented in the table.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[$] Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest; 7 = Child Age Pretest; 8 = PSI Child Related Stress Pretest; 9 = Number of siblings receiving special education services, 10 = Child's sex

$$\hat{ES} = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[♦] Each of the SPECS scores include a different number of items, each of which are ranked by the teacher on a Likert-type scale of 1 to 5. A score of 5 represents development in that area that is typical of peers and a score of 1 represents development that is atypical or problematic. Therefore, the optimal developmental score for communication is 10; sensorimotor, 20; physical, 15; self-regulation, 20; cognition, 10; self-social, 20.

[&] ANCOVA analyses were done using the adjusted raw scores for the MCDI. Age equivalent scores have been used for the means and adjusted means in the table for easier understanding

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Table 9.10 (continued)

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups (Posttests #1 - #5) in the 1986 Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
POSTTEST #3												
● **Age in months at Posttest #3**[@]	--	74.1	(9.6)		26	72.6	(11.2)		25	.25	.62	-.16
● **Battelle Developmental Inventory (BDI) Raw Scores for:**[*]												
Personal-Social	1,5	113.8	(34.7)	115.6	26	128.3	(23.3)	126.5	25	2.82	.10	.31
Adaptive Behavior	2,3	73.3	(17.8)	76.1	26	83.4	(15.2)	80.6	25	1.85	.18	.25
Motor	3	93.2	(28.1)	98.9	26	107.6	(27.5)	101.9	25	.57	.45	.11
Communication	4,5	56.9	(22.6)	58.9	26	64.6	(21.6)	62.6	25	.68	.41	.16
Cognitive	4,5	45.2	(17.2)	47.3	26	59.4	(22.7)	57.4	25	6.35	.02	.59
Total	6	382.4	(99.1)	393.7	26	443.0	(92.0)	431.7	25	3.87	.06	.38
POSTTEST #4												
● **Child Age at Posttest**[@]	--	84.3	(10.9)		28	83.0	(11.6)		24	.19	.67	-.12
● **Battelle Developmental Inventory (BDI) Raw Scores for:**[*]												
Personal-Social	1,4	128.8	(33.9)	129.2	28	144.1	(22.8)	143.7	24	5.13	.03	.43
Adaptive Behavior	2,3	79.1	(21.6)	81.3	28	89.8	(17.5)	87.7	24	2.31	.14	.30
Motor	3	101.4	(31.8)	106.1	28	116.3	(32.9)	111.6	24	1.28	.26	.17
Communication	4,5	64.4	(23.9)	66.8	28	75.0	(24.5)	72.5	24	1.70	.20	.24
Cognitive	4,5	59.8	(26.3)	62.3	28	72.1	(25.8)	69.6	24	2.03	.16	.28
Total	6	433.5	(114.6)	443.2	28	497.3	(105.5)	487.7	24	4.11	.05	.39
● **Teacher's Developmental SPECS**[♦]												
Communication	4	6.8	(1.7)	6.9	25	6.4	(1.9)	6.3	22	1.47	.23	-.35
Sensorimotor	3	14.0	(3.7)	14.3	25	14.8	(3.0)	14.5	22	.07	.80	.05
Physical		11.6	(1.7)	11.6	25	12.2	(1.7)	12.2	22	1.36	.25	.35
Self-Regulation	6	13.8	(3.6)	13.9	25	16.0	(3.3)	15.9	22	4.27	.05	.56
Cognition	5	5.6	(2.3)	5.7	25	6.3	(2.3)	6.1	22	.52	.48	.17
Self/Social	6	12.7	(3.7)	12.8	25	14.6	(3.2)	14.5	22	3.02	.09	.46
● **School Placement**												
% eligible for special education		96.0			25	86.4			22		.27	.28
% time in typical classroom		26.3	(34.5)		26	37.3	(40.5)		21	1.00	.32	.32
% time in full-time special education		73.1	(34.6)		26	56.8	(46.3)		21	1.90	.18	.45

(continued)

[#] Covariance adjusted means

[*] Statistical analyses for the BDI were conducted using raw scores and these are presented in the table.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[$] Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest; 9 = Number of siblings receiving special education services, 10 = Child's sex

$$\hat{ES} = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[♦] Each of the SPECS scores include a different number of items, each of which are ranked by the teacher on a Likert-type scale of 1 to 5. A score of 5 represents development in that area that is typical of peers and a score of 1 represents development that is atypical or problematic. Therefore, the optimal developmental score for communication is 10; sensorimotor, 20; physical, 15; self-regulation, 20; cognition, 10; self-social, 20.

Table 9.10 (continued)

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups (Posttests #1 - #5) in the Utah Parent Involvement Study

Variable	Covariates[$]	Center-based only $\bar{X}$	(SD)	Adj.$\bar{X}$[#]	n	Center-based + PIE $\bar{X}$	(SD)	Adj.$\bar{X}$[#]	n	ANCOVA F	p Value	ES[^]
POSTTEST #5												
● **Age in months at Posttest #5**[@]		98.0	(10.5)		28	96.6	(11.2)		28	.22	.64	-.13
● **Woodcock-Johnson Revised Achievement Raw Scores for:**												
Broad Knowledge Total	6	37.9	(18.2)	39.0	28	43.0	(15.2)	42.0	25	.50	.48	.16
Skills Knowledge Total	6,9	30.0	(24.0)	33.0	28	43.2	(24.1)	40.1	25	1.27	.27	.30
● **Scales of Independent Behavior** (SIB)												
Motor Skills	3,9	54.4	(17.8)	57.5	28	62.2	(17.1)	59.0	24	.19	.66	.08
Social/Communication Skills	6,9	78.4	(18.7)	80.8	28	87.3	(17.2)	84.9	24	.87	.36	.22
Personal Living Skills	3,9	110.4	(39.2)	116.7	28	119.0	(32.4)	112.6	24	.30	.59	-.10
Community Living Skills	6	42.4	(21.7)	43.9	28	55.5	(24.7)	54.0	24	3.31	.08	.47
Total	6,9	285.5	(80.7)	300.4	28	324.0	(78.8)	309.1	24	.21	.65	.11
● **Teacher Developmental SPECS**[♦]												
Communication	4	6.5	(1.4)	6.5	28	7.0	(1.8)	7.0	25	1.08	.30	.36
Sensorimotor	3	15.0	(2.6)	15.2	28	16.0	(2.6)	15.8	25	.63	.43	.23
Physical		11.3	(2.2)	11.3	28	12.2	(1.9)	12.2	25	2.59	.11	.41
Self-Regulation	6	13.7	(3.4)	13.8	28	14.8	(3.4)	14.7	25	.91	.35	.26
Cognition	5	5.4	(2.2)	5.5	28	6.1	(2.5)	6.0	25	.47	.50	.23
Self-Social	6	12.9	(3.5)	13.1	28	13.8	(3.7)	13.7	25	.42	.52	.17
● **School Placement**												
% retained in grade		7.1			28	12.0			25	.35	.56	.00
% eligible for special education		89.3			28	84.0			25	.31	.58	.33
% in typical classroom	6	21.4		22.6	28	36.0		34.8	25	.96	.33	.30
% in full-time special classroom	6	64.3		62.5	28	48.0		49.8	25	.88	.35	.23
● **Social Skills (SSRS)**												
Parent Evaluation of Social Skills	6	41.0	(16.4)	41.8	28	46.0	(12.3)	45.2	24	.87	.36	.21
Parent evaluation of problem behaviors		15.0	(4.5)	15.0	28	14.0	(5.9)	14.0	24	.48	.49	.22
Teacher evaluation of Social Skills	6	30.9	(12.0)	31.6	28	32.5	(12.7)	31.8	25	.00	.97	.02
Teacher Evaluation of Problem behaviors		13.5	(6.5)	13.5	28	10.8	(5.9)	10.8	25	2.56	.12	.42
● **Perceived Competence and Social Acceptance**[&]												
Cognitive Competence	5,10	20.8	(2.6)	20.8	20	20.1	(2.8)	20.1	21	.89	.35	-.27
Physical Competence	3,10	16.2	(5.5)	16.9	20	18.1	(4.0)	17.5	21	.21	.65	.11
Social Acceptance by Peers	3,10	17.2	(4.3)	16.9	20	17.7	(4.5)	18.0	21	.57	.46	.26
Social Acceptance by Mother	10	18.3	(3.8)	18.3	20	18.0	(3.8)	17.9	21	.08	.78	-.11

[#] Covariance adjusted means

[$] Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest; 7 = Child Age Pretest; 8 = PSI Child Related Stress Pretest; 9 = Number of siblings receiving special education services, 10 = Child's sex

$$\hat{ES} = \frac{\text{Center-Based + PIE Adj}\bar{x} - \text{Center-based Adj}\bar{x}}{\text{Center-Based SD}}$$

[♦] Each SPECS score includes a different number of items, each of which are ranked by the teacher on a Likert-type scale of 1 to 5. A score of 5 represents development in that area that is typical of peers and a score of 1 represents development that is atypical or problematic. Therefore, the optimal developmental score for communication is 10; sensorimotor, 20; physical, 15; self-regulation, 20; cognition, 10; self-social, 20.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

This measure uses broad knowledge and skills knowledge raw achievement scores to measure child developmental outcomes. Higher scores indicate greater achievement.

[♣] The SIB measures, from parent report, the child's degree of independence in the domains of motor. High scores represent higher degrees of independent behaviors.

Scores in this category represent percentages related to child's present educational placement.

Analyses are based on raw scores with higher scores interpreted as better.

[&] Social Readjustment Rating Scale (SRRS). Scores are derived from the Holmes and Rahe. Lower scores are interpreted as better.

Other measures taken at Posttest #4 seem to echo the BDI differences between the groups for this posttest. The teachers evaluated the children's development in six areas, communication, sensorimotor, physical, self-regulation, cognition, and self/social using the Developmental SPECS (Bagnato & Neisworth, 1989). The children in the parent involvement group did better than the children in the center-based group on five of the six scales with statistically significant differences for the self-regulation and self/social subscales.

Information allowing the investigation of the effect of parent instruction on later school placement was provided by teacher questionnaires at Posttests #2 and #4. At Posttest #2, only 12 of the 56 children were in school, but by Posttest #4, the youngest child in the sample was over five years of age. At this time, 50 of the 52 children tested were in some type of public school (preschool to second grade), one was in a private preschool program, and one in a home-based program. More children in the center-based group were eligible for special education services (96% compared to 86.4% for the parent involvement group). Likewise, more children in the center-based group attended special education classes; conversely, more children in the parent involvement group attended typical classes (see Table 9.10). These differences favored the children in the parent involvement group. The effect sizes were substantial, but the differences were not statistically significant.

Posttest #5 comparisons. At Posttest #5, however, the child performance on the various developmental, perceived competence, and school placement measures appeared to be comparable between the two groups (refer to Table 9.10). On 23 of the 26 scores, the children in the parent involvement group did better than did the children in the center-based group, but the differences in most cases were minimal. Only on one score was there a statistically significant difference.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

The research question addressed in this part of the analyses was whether adding a parent instruction component to an early intervention program results in changes in family functioning. To investigate these possible effects, measures of parenting stress (PSI), family adaptability and cohesion (FACES III), and family support (FSS) were given to the parents at Posttest #1 to #4. In addition, at Posttest #1 and #2, the Child Improvement Questionnaire was given to measure the parents' perception of the factors that affect the progress of their child. At Posttest #5, the Comprehensive Evaluation of Family Functioning (CEFF) was included as a measure of functioning of those areas that may be impacted by having a child with special needs. The Parent Self-Awareness Scale was used to measure the parent's perceived level of capabilities, and the Family APGAR was used as a general measure of family functioning.

Results of the analysis of measures of family functioning for the five posttests are shown in Table 9.11. The two groups of families experienced similar levels of stress across all five posttests except for one statistically significant difference in favor of the center-based group at Posttest #2. Given the consistent pattern of no differences at all on other posttests, this was probably the result of sampling fluctuation associated with the reduced sample size at Posttest #2. The families in both groups consistently experienced more child-related stress than parent-related stress with child-related stress for both groups being at the 80th percentile or higher. Parent-related stress scores for both groups were at about the 75th percentile at Posttest #1 and at the later posttests; they averaged approximately at the 66th percentile.

No statistically significant differences were found between the mean group scores on family adaptability, and the relative position of the two groups with regard to being more adaptable changed at different posttests. The adaptability

Table 9.11

Comparison of Posttest Measures of Family Functioning for Subjects in Center-Based and Parent Involvement Groups (Posttests #1 - #5) in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates[$]	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	F	p Value	ES[^]
POSTTEST #1														
● **Parent Stress Index**[♦]														
Child Related Range (47 to 235)	0,1,2,3	121.7	(23.5)	121.1	89	26	122.2	(16.8)	122.9	90	25	.15	.70	-.08
Other Related Range (54 to 270)	0,2,4,7	135.8	(31.8)	127.4	75	24	139.8	(21.6)	138.2	76	25	.03	.87	-.03
Total Range (101 to 505)	0,2,3,5	257.4	(50.0)	259.8	85	26	262.2	(36.6)	259.8	86	25	.00	1.00	.00
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]														
Adaptability Range (0 to 50)	4,9,11	25.3	(5.3)	25.0		28	24.8	(5.6)	25.1		27	.00	.95	.02
Cohesion Range (0 to 50)	10,12	37.0	(6.2)	37.6		27	41.0	(4.3)	40.4		28	6.21	.02	.45
● **Family Support Scale (FSS)**[&]	2,3,4	27.5	(10.4)	27.7	51	26	32.3	(10.5)	32.1	67	26	3.30	.08	.42
● **Child Improvement Questionnaire-Revised**[@]														
Professional		19.0	(3.6)			28	19.6	(3.6)			28	.31	.58	.17
Divine Intervention		11.3	(3.8)			28	10.5	(3.3)			28	.75	.39	-.21
Parent		24.1	(3.9)			28	24.6	(2.3)			28	.29	.59	.13
Child		21.5	(3.9)			28	20.0	(3.5)			28	2.18	.15	-.38
Change		9.2	(3.0)			28	9.8	(1.9)			28	.73	.40	.20
● **CES-D (depression)**[♣][*]		36.4	(12.4)			28	33.4	(11.7)			28	.89	.35	-.24

[*] Results computed among t-tests. Means are not adjusted.

[#] Covariance adjusted means.

[$] 0 = PSI other related, 1 = PSI child related stress, 2 = FSS total score, 3 = BDI total score, 4 = FILE, 5 = Mother's years of education, 6 = Father's years of education, 7 = Mother's work hours outside home, 8 = Child's age at pretest, 9 = Mom's age at pretest, 10 = Dads age at pretest, 11 = FACES pretest adaptability of family interaction patterns, 12 = FACES pretest cohesiveness of family interaction patterns, 13 = Number of siblings receiving special ed. services, 14 = FRS total score, 15 = Child living with both parents, 16 = PSI total score, 17 = Total income, 18 = Mother's occupation.

[&] Analyses for FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[♦] Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

[^]
$$ES = \frac{\text{Center-Based + PIE Adj.}\bar{X} - \text{Center-based Adj.}\bar{X}}{\text{Center-Based SD}}$$

[@] Assesses parental perceptions of factors that affect child's developmental progress.

[♣] Assesses parental depression.

Table 9.11 (continued)

Comparison of Posttest Measures of Family Functioning for Subjects in Center-Based and Parent Involvement Groups (Posttests #1 - #5) in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	F	p Value	ES^
POSTTEST #2														
● **Parent Stress Index**[♦]														
Child Related Range (47 to 235)	0,1,3,4,11	117.4	(19.9)	116.8	86	21	114.7	(16.2)	115.4	82	20	.14	.71	.07
Other Related Range (54 to 270)	0,4	126.8	(26.3)	127.8	63	21	137.8	(18.4)	136.7	75	20	4.07	.05	-.34
Total Range (101 to 505)	0,4	244.2	(43.0)	246.1	77	21	252.5	(31.8)	250.5	80	20	.42	.52	-.10
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]														
Adaptability Range (0 to 50)	10,11	24.7	(5.4)	24.6		20	25.9	(5.2)	26.0		20	1.39	.25	.26
Cohesion Range (0 to 50)	12	38.8	(5.8)	39.1		21	42.0	(3.9)	41.7		20	3.69	.06	.45
● **Family Support Scale (FSS)**[&]	0,2,4	29.8	(10.3)	30.5	63	20	31.9	(9.9)	31.3	63	19	.11	.74	.08
● **Child Improvement Questionnaire-Revised**[*][@]														
Professional	--	24.9	(5.2)			21	22.7	(4.6)			19	1.89	.18	-.42
Divine Intervention	--	14.2	(4.7)			21	11.4	(3.9)			19	4.19	.05	-.60
Parent	--	28.8	(4.8)			21	27.8	(4.3)			19	.40	.53	-.21
Child	--	23.9	(4.3)			21	23.6	(4.3)			19	.06	.81	-.07
Chance	--	12.2	(3.6)			21	10.8	(3.0)			19	1.60	.21	-.39

[*] Results computed among t-tests. Means are not adjusted.

[#] Covariance adjusted means.

[$] 0 = PSI other related, 1 = PSI child related stress, 2 = FSS total score, 3 = BDI total score, 4 = FILE, 5 = Mother's years of education, 6 = Father's years of education, 7 = Mother's work hours outside home, 8 = Child's age at pretest, 9 = Mom's age at pretest, 10 = Dads age at pretest, 11 = FACES pretest adaptability of family interaction patterns, 12 = FACES pretest cohesiveness of family interaction patterns, 13 = Number of siblings receiving special ed. services, 14 = FRS total score, 15 = Child living with both parents, 16 = PSI total score, 17 = Total income, 18 = Mother's occupation.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[♦] Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

[^] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[@] Assesses parental perceptions of factors that affect child's developmental progress.

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Table 9.11 (continued)

Comparison of Posttest Measures of Family Functioning for Subjects in Center-Based and Parent Involvement Groups (Posttests #1 - #5) in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates$	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	F	p Value	ES^
POSTTEST #3														
● **Parent Stress Index♦**														
Child Related Range (47 to 235)	1,5	119.3	(22.1)	118.5	87	26	116.6	(14.1)	117.4	86	23	.06	.81	.05
Other Related Range (54 to 270)	0,4,5	128.0	(27.0)	129.4	65	26	129.0	(15.7)	127.6	63	22	.13	.72	.07
Total Range (101 to 505)	0,1,4,5	247.3	(42.6)	247.6	78	26	245.1	(26.7)	244.7	76	22	.13	.72	.07
● **Family Adaptation and Cohesion Evaluation Scales (FACES)+**														
Adaptability Range (0 to 50)	6,11	24.3	(5.3)	24.6		26	24.5	(4.4)	24.3		24	.08	.78	-.06
Cohesion Range (0 to 50)	12	35.9	(7.2)	36.5		26	38.1	(5.0)	37.5		24	.42	.52	.14
● **Family Support Scale (FSS)&**	2,4	30.5	(13.7)	30.4	59	26	26.5	(8.0)	26.6	48	23	1.76	.19	-.28
POSTTEST #4														
● **Parent Stress Index♦**														
Child Related Range (47 to 235)	1,3,5	118.0	(20.6)	117.6	87	28	112.8	(16.2)	113.3	79	23	.94	.34	.21
Other Related Range (54 to 270)	0,1,5,13	127.3	(25.1)	130.3	66	28	133.4	(16.6)	130.4	66	23	.00	.99	.00
Total Range (101 to 505)	1,4,5	242.1	(39.5)	242.7	74	28	245.2	(27.7)	244.6	76	22	.06	.81	-.05
● **Family Adaptation and Cohesion Evaluation Scales (FACES)+**														
Adaptability Range (0 to 50)	11	26.1	(6.2)	26.3		28	24.6	(5.2)	24.4		24	1.49	.23	-.31
Cohesion Range (0 to 50)	12,14	38.0	(6.0)	38.4		28	40.1	(4.3)	39.7		23	.99	.33	.22
● **Family Support Scale (FSS)&**	2,3,11	27.0	(9.7)	27.4	48	27	27.5	(8.4)	27.1	48	24	.01	.93	-.03
● **Teacher Rating of Parents' Participation in Education Program:**														
Attendance		4.2	(1.2)			22	5.3	(1.8)			21	5.62	.02	.92
Support/Participation	17	15.1	(4.0)	14.9		21	17.9	(5.5)	18.1		19	4.91*	.03*	.80*
Knowledge		13.6	(3.6)			20	18.6	(7.9)			19	6.38	.02	1.39

(continued)

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* Results computed among t-tests. Means are not adjusted.

$ 0 = PSI other related, 1 = PSI child related stress, 2 = FSS total score, 3 = BDI total score, 4 = FILE, 5 = Mother's years of education, 6 = Father's years of education, 7 = Mother's work hours outside home, 8 = Child's age at pretest, 9 = Mom's age at pretest, 10 = Dads age at pretest, 11 = FACES pretest adaptability of family interaction patterns, 12 = FACES pretest cohesiveness of family interaction patterns, 13 = Number of siblings receiving special ed. services, 14 = FRS total score, 15 = Child living with both parents, 16 = PSI total score, 17 = Total income, 18 = Mother's occupation.

& Analyses for FSS and FRS are based on raw scores indicating number of supports or resources indicated by family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

+ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

♦ Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

^ $$\text{ES} = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

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Table 9.11 (continued)

Comparison of Posttest Measures of Family Functioning for Subjects in Center-Based and Parent Involvement Groups (Posttests #1 - #5) in the 1986 Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates$	$\bar{x}$	(SD)	Adj.$\bar{x}$#	n	$\bar{x}$	(SD)	Adj.$\bar{x}$#	n	ANCOVA F	p Value	$\widehat{ES}$
POSTTEST #5												
● Family Support (FSS)												
Family Support Total	2,12,15	27.3	(11.6)	28.1	28	26.4	(11.3).	25.6	24	.78	.38	-.22
● Family Functioning (CEFF)												
Time Demands	5	14.5	(5.6)	14.7	28	14.1	(5.7)	13.9	24	.27	.61	.14
Acceptance-Problems	1,5	26.3	(6.7)	26.3	28	24.9	(4.2)	24.9	23	.88	.35	.21
Coping	1	15.7	(5.2)	15.6	28	15.2	(4.0)	15.4	23	.03	.85	.04
Social Relationship	1,5	15.1	(5.2)	15.2	28	13.6	(4.2)	13.5	23	1.69	.20	.33
Financial		4.8	(2.6)	4.8	28	4.8	(1.8)	4.8	24	.01	.91	.00
Well Being	5	15.0	(4.2)	15.2	28	14.5	(3.7)	14.4	24	.51	.48	.19
Sibling Relationship		25.1	(11.7)	24.9	28	26.2	(8.6)	26.5	23	.30	.59	-.12
Situational Stress	1	22.6	(9.3)	22.5	28	20.2	(9.0)	20.4	23	.67	.42	.23
Total	12,15,16	91.5	(23.3)	90.0	28	86.7	(17.9)	88.2	23	.10	.75	.08
Total Number of Problems	4,16	7.6	(8.5)	7.8	28	7.0	(8.3)	6.1	22	.54	.46	.20
● Family Function (APGAR)												
Adaptability	1,5,15	2.9	(.9)	3.0	28	3.0	(.8)	3.0	23	.00	.97	.00
Partnership	5	2.6	(.8)	2.6	28	2.9	(.8)	2.9	24	1.96	.17	.38
Growth	5	2.4	(1.0)	2.4	28	2.8	(.7)	2.9	24	4.07	.05	.50
Affection	5	2.9	(.9)	2.8	28	2.7	(.7)	2.7	24	.24	.63	-.11
Resolve	5	2.9	(.8)	2.8	28	2.8	(.7)	2.8	24	.07	.80	.00
Total	5,12	13.7	(3.5)	13.7	28	14.2	(2.9)	14.2	24	.40	.53	.14
● Family Participation in Child's Educational Program												
Knowledge of Education Program	6,18	9.1	(2.3)	9.0	27	9.9	(2.1)	9.9	25	2.43	.19	.39
Support of Education Program	4,6,18	16.3	(3.4)	16.3	27	17.3	(3.2)	17.3	25	1.74	.13	.29
● Parent Self Awareness Scale Total Score	5,8,11,12	41.9	(8.4)	42.5	27	41.6	(6.3)	41.0	24	.63	.43	-.18

$ 0 = PSI other related, 1 = PSI child related stress, 2 = FSS total score, 3 = BDI total score, 4 = FILE, 5 = Mother's years of education, 6 = Father's years of education, 7 = Mother's work hours outside home, 8 = Child's age at pretest, 9 = Mom's age at pretest, 10 = Dads age at pretest, 11 = FACES pretest adaptability of family interaction patterns, 12 = FACES pretest cohesiveness of family interaction patterns, 13 = Number of siblings receiving special ed. services, 14 = FRS total score, 15 = Child living with both parents, 16 = PSI total score, 17 = Total income, 18 = Mother's occupation.

$$\widehat{ES} = \frac{\text{Center-Based + PIE Adj}\bar{x} - \text{Center-based Adj}\bar{x}}{\text{Center-Based SD}}$$

Covariance adjusted means.

scores averaged midway on the adaptability continuum (ranging from rigid to very flexible) (Olson & Tiesel, 1991).

The parent involvement group reported higher (better) cohesion scores across Posttests #1 through #4 than did the center-based group, and the scores were statistically significantly higher at Posttest #1 and #2. The cohesion scores (for both groups) also lie midway in the cohesion continuum (ranging from disengaged to very connected) (Olson & Tiesel, 1991).

The difference in reported social support was significantly different at Posttest #1 (p = .08, ES = .42) with the families in parent involvement group reporting more social support than did the families in the center-based group. At Posttest #2, the families again reported more social support than did the center-based group, but the difference was not statistically significant. At Posttest #3, #4, and #5, the results were reversed with the families in the center-based group reporting more social support than the families in the parent involvement group, but again, the differences were not statistically significant.

At Posttest #5, the families in the two groups appeared to be functioning very similarly as measured by the various family measures. No statistically significant differences were found between the groups on the Comprehensive Family Functioning Scale, the Family APGAR Scale, or the Parent Self Awareness Scale.

It is possible that the P.I.E. program might have influenced the parents' attitudes concerning responsibility for and participation with interveners in the child's education program. At Posttests #2, and #4, teachers rated the parents' participation in the educational program from less than other parents (1) to more than other parents (3) on 15 items. The items were summed into three variables (parent attendance, parent knowledge, and parent support). At Posttest #5, the scale was revised to 11 items, which were summed into two variables, parent knowledge and support. At Posttest #2, the number of children in public school were few, and no differences were seen between the groups in parent attendance, knowledge, and support. However, at Posttest #4, the group comparison (see Table 9.11) showed that the parents who participated in the PIE program were considered more knowledgeable about their children's education (p = .02, ES = 1.39), more supportive (p = .07, ES = .70), and attended more of the educational meetings (p = .02, ES = .92) than did the parents in the center-based group. At Posttest #5, teacher ratings on these variables still favored the parent involvement group, but were not statistically significant.

Parent Attendance: Participation Comparison

Straightforward comparisons of all the subjects in each group (center-based only vs. parent involvement) may not provide an adequate test of the effectiveness of this type of parent involvement program because data for parents who were invited, but did not attend regularly were included in the parent involvement group data. Attendance at the instructional sessions varied a great deal with a parent from one family not attending any of the 15 sessions, and a parent from one family attending all 15. On the average, the parents attended 9 of the 15 sessions. Thirteen parents attended 11 or more sessions, 6 parents attended 7 to 10 sessions, and 9 parents attended 6 sessions or less. Analyses were performed comparing the BDI, WJ-R, and SIB scores of the children whose parents attended most of the instructional sessions (11 or more) with those whose parents were in the center-based group and were not invited to the PIE sessions (28). These participation comparisons were done to see if the parents who participated most extensively in the PIE program, greater realized benefits than those who did not participate in the parent involvement component. The generalizability of these analyses are limited by the small number (13) in the high attending group.

To compare group differences between the high attending parent group and the center-based group, preliminary analyses were performed to see how the two groups matched on demographic and pretest variables, and to identify covariates. The demographic characteristics of the high attending group and the center-based group were very similar (see Table 9.12). The covariates, usually the same scale taken at pretest, are identified in Table 9.13.

Table 9.12

Comparison on Key Demographic Variables of the Center-Based and High Attendance Groups in the 1986 Parent Involvement Study

	Center-Based Only			Attended 11 or more PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Age of child in months as of 11/15/86	43.0	10.5	28	42.1	11.4	13	.80	-.09
• Age of mother in years	33.4	5.8	28	31.9	7.2	13	.48	-.26
• Age of father in years	35.9	6.2	27	35.0	8.4	13	.68	-.15
• Percent Male[*]	57.1		28	30.8		13	.12	-.47
• Years of Education--Mother	13.8	1.7	28	13.5	1.6	13	.56	-.18
• Years of Education--Father	13.8	2.1	28	14.3	2.2	13	.47	.24
• Percent with both parents living at home[*]	78.6		28	100.0		13	.07	.44
• Percent of children who are caucasian[*]	82.1		28	92.3		13	.40	.17
• Hours per week mother employed	8.4	13.7	26	2.6	6.4	13	.16	-.42
• Hours per week father employed	42.8	15.5	21	43.5	15.7	13	.90	.05
• Percent of mothers employed as technical managerial or above[*]	10.7		28	0.0		13	.23	-.21
• Percent of fathers employed as technical managerial or above[*]	61.5		26	45.5		11	.38	-.29
• Total household income[+]	$21,785	$12,728	28	$22,961	$13,022	13	.79	.09
• Percent with mother as primary caregiver[*]	96.4		28	100.0		13	.50	.00
• Number of siblings	2.1	1.7	28	1.8	1.0	13	.52	-.18
• Number of siblings with disabilities	.1	.3	28	.4	.7	13	.03	1.00

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

[+] Income data were converted from categorical to continuous data by using the midpoint of each category.

[^] Effect size is defined here as the difference between the groups (center + PIE minus center) on the ANCOVA scores, divided by the unadjusted standard deviation of the center-based intervention group. (See Glass, 1976; Tallmadge, 1977; & Cohen, 1977, for a more general discussion of the concept of Effect Size.) The sign of ES only indicates direction of difference; no value judgement is intended.

Table 9.13

Comparison of Posttest Measures of Child Functioning for Children of Parents Who Attended 11 or More PIE Instruction Sessions, and Children of Parents in the Center-Based Only Group

		Center-based only				Attended 11 or more PIE Sessions						
Variable	Covariates[&]	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
POSTTEST #1												
Battelle Developmental Inventory (BDI) Raw Scores for:												
Personal-Social	1,5,7[♦]	87.3	(28.0)	90.9	28	107.1	(25.6)	103.5	13	4.58	.04	.45
Adaptive Behavior	2,3,7	56.7	(15.4)	58.7	28	64.5	(12.9)	62.5	13	1.86	.18	.25
Motor	3,7	77.4	(23.9)	80.7	28	82.6	(24.1)	79.4	13	.17	.68	-.05
Communication	4,5,7	44.0	(16.4)	47.8	28	51.1	(20.8)	47.3	13	.03	.86	-.03
Cognitive	5,7	34.3	(13.7)	36.5	28	40.1	(15.1)	37.8	13	.26	.62	.09
Total	6,7	298.9	(20.1)	57.5	28	65.7	(13.7)	62.0	13	2.45	.13	.22
POSTTEST #2												
Battelle Developmental Inventory (BDI) Raw Scores for:												
Personal-Social	1,5,7	101.7	(23.9)	103.3	20	119.1	(20.8)	117.5	10	6.57	.02	.60
Adaptive Behavior	2,3,7	67.4	(15.7)	68.3	20	74.0	(11.8)	73.1	10	1.67	.21	.31
Motor	3,7	92.4	(20.5)	94.5	20	100.5	(18.9)	98.4	10	1.00	.33	.19
Communication	4,5,7	50.4	(17.7)	54.1	20	60.4	(19.2)	56.7	10	.38	.55	.15
Cognitive	4,5,7	41.4	(16.2)	44.5	20	52.7	(17.5)	49.6	10	2.12	.16	.31
Total	6,7	353.2	(76.4)	363.3	20	406.7	(71.9)	396.6	10	5.41	.03	.44
POSTTEST #3												
Battelle Developmental Inventory (BDI) Raw Scores for:												
Personal-Social	1,5	113.8	(34.7)	116.4	26	132.7	(24.3)	130.1	11	2.48	.13	.39
Adaptive Behavior	2,3	73.3	(17.8)	75.2	26	83.8	(13.3)	82.0	11	2.50	.12	.38
Motor	3	93.2	(28.1)	97.0	26	104.0	(25.0)	100.3	11	.41	.53	.12
Communication	4,5	56.8	(22.6)	59.8	26	69.5	(19.9)	66.5	11	1.47	.23	.30
Cognitive	4,5	45.2	(17.2)	47.5	26	61.5	(21.9)	59.1	11	7.31	.01	.67
Total	6	382.4	(99.1)	393.7	26	450.6	(80.2)	439.3	11	3.57	.07	.46
POSTTEST #4												
Battelle Developmental Inventory (BDI) Raw Scores for:												
Personal-Social	1,5	128.8	(33.9)	131.5	28	142.2	(24.0)	139.5	12	1.00	.33	.24
Adaptive Behavior	2,3	79.1	(21.6)	80.9	28	90.0	(16.0)	88.3	12	1.78	.19	.34
Motor	3	101.4	(31.8)	104.7	28	114.6	(30.8)	111.3	12	1.07	.31	.21
Communication	4,5	64.4	(23.9)	68.5	28	79.1	(23.5)	74.9	12	1.49	.23	.27
Cognitive	4,5	59.8	(26.3)	63.4	28	72.6	(23.5)	69.0	12	.83	.37	.21
Total	6	433.5	(114.6)	447.3	28	498.4	(97.2)	484.7	12	1.88	.18	.33
POSTTEST #5												
Woodcock-Johnson Test of Achievement-Revised (WJ-R) for:												
Broad Knowledge	5	37.9	(18.2)	39.5	28	44.3	(14.5)	42.7	12	.37	.55	.18
Skills Knowledge	5	30.0	(24.0)	32.4	28	45.4	(24.5)	43.0	12	2.19	.15	.44
Scale of Independent Variables												
Motor Skills	3	54.4	(17.8)	56.0	28	61.7	(15.6)	60.0	12	.99	.33	.22
Social Communication Skills	6	78.4	(18.7)	80.2	28	88.3	(17.1)	86.4	12	1.37	.25	.33
Personal Living Skills	6	110.4	(39.2)	112.8	28	116.5	(30.6)	114.1	12	.01	.92	.03
Community Living Skills	6	42.4	(21.7)	44.5	28	56.5	(26.3)	54.4	12	1.99	.17	.46
Total	6	285.5	(80.7)	292.9	28	322.9	(71.4)	315.6	12	.95	.34	.28

[&] Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest; 7 = Child Age Pretest; 8 = PSI Child Related Stress Pretest; 9 = Number of Siblings Receiving Special Education Services; 10 = Child's Sex

[^]
$$\text{ES} = \frac{\text{Center-based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-based SD}}$$

[♦] Child's age at pretest correlated highly with the outcome measures for Posttests #1 and #2, but not at the later posttests. Therefore, it was used as a covariate only for Posttests #1 and #2.

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The children whose parents were high attenders scored statistically significantly better than did the children in the center-based group on the total scale at Posttest #2 and #3, and on the personal/social scale at Posttests #1 and #2 (see Table 9.13). It is also interesting to note that of the 31 measures reported in Table 9.13, 29 favor the parent involvement group, although only 5 are statistically significant. However, if participation in the PIE program did contribute to better child functioning, then one would expect the differences between the scores of children of high attending parents and the center-based group to be greater than those between the total parent involvement group and the center-based group (compare Tables 9.10 and 9.13). To the contrary, there were fewer significant differences in the participation comparison (high vs. no comparisons).

Comparisons of family functioning were also performed for the high attenders and the center-based groups. Across posttests, the two groups did not differ significantly on parenting stress (as measured by the PSI), family social support (FSS), or family adaptability (FACES III). However, the family cohesion (FACES III) scores were statistically significantly different at Posttests #1 ($\underline{p}$ value = .006, ES = .68), #2 ($\underline{p}$ value = .03, ES = .73), and #4 ($\underline{p}$ value = .10, ES = .50), with the families in the high attending reporting more positive scores. At Posttest #5, no differences were found on the family functioning measures (as measured by the CEFF and APGAR) except for one subdomain on the Family APGAR scale. These findings on family functioning (as were the child functioning findings) are similar to, but are no stronger than, the differences between the total parent involvement group and the center-based group.

Other Analyses

Parent-child interaction. Another way to investigate possible effects of this type of parent involvement program is to measure parent-child behaviors in a free-play interaction sequence. Parent-child dyads were videotaped at Posttests #1, #2, and #4. These interaction tapings were approximately 20 minutes in length and followed a written protocol. Toys and books were provided. Most of the time was spent in free play, followed by a cleaning up of toys, joint book reading, parent leaving for 45 seconds, returning, and more free play. The videotapes were coded by two parent-child interaction rating systems (i.e. The Parent/Caregiver Involvement Scale [PCIS], Farran et al., 1986, and The Parental Behavior Rating Scale [PBRS], Mahoney, 1988). The codings were completed by coders who were uninformed about the research under the direction of the respective authors. The Posttest #1 and #2 videotapes were coded with both the PCIS and the PBRS coding systems; Posttest #4 videotapes were coded with the PBRS system.

The PCIS scale measures 11 parent or caregiver behaviors. These scales include: physical involvement, verbal involvement, responsiveness, play interaction, teaching behavior, control, directives, relationship among activities in which caregiver was involved, positive statements, negative statements/discipline, and goal setting. Each of these caregiver behaviors were rated separately for amount of behavior, quality of behavior, and appropriateness of behavior on 5-point Likert-type scales. The amount scores for the 11 variables were summed and averaged resulting in an amount score. Similarly, quality and appropriateness were rated. In comparing these cumulative variables for the two groups, child age, sex and BDI total development score at pretest were considered for covariates, but the correlations were so low they were not used in the analyses. The parents in the parent involvement were statistically significantly rated higher in quality of interaction than the parents in the center-based group at Posttest #1 ($\underline{p}$ = .03, ES = .57) (see Table 9.14). The rating for appropriateness of interaction was also higher for parent involvement group, but did not reach the .10 level of significance ($\underline{p}$ = .12, ES = .50). These videotapes of parent child interaction took place approximately two months after the

Table 9.14

Comparison of Parental Behaviors as Coded by the PCIS (Farran) For Parents in the Center-Based and Parent Involvement Groups for Posttest #1 and #2

Variable		Center-Based			Center-Based + PIE			ANCOVA	p	
		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	Value	ES^
POSTTEST #1										
Average Rating:	Amount	2.8	(.6)	26	2.7	(.4)	22	.47	.50	-.16
	Quality	3.7	(.7)	26	4.1	(.6)	22	5.12	.03	.57
	Appropriateness	3.9	(.6)	26	4.2	(.7)	22	2.47	.12	.50
POSTTEST #2										
Average Rating:	Amount	3.0	(.6)	19	3.0	(.6)	17	.05	.83	.00
	Quality	3.9	(.9)	19	4.2	(.6)	17	1.01	.32	.33
	Appropriateness	4.1	(.9)	19	4.2	(.8)	17	.59	.45	.11

[a] Involvement was rated (with a Likert-type scale, range 1-5) over 11 parent/caregiver behaviors (Physical Involvement, Verbal Involvement, Responsiveness to Child, Play Interaction, Teaching Behavior, Control Activities, Directiveness/Demands, Relationship Among Activities, Positive Statements/Regard, Negative Statements/Regard, Goal Setting). Average ratings were then computed for the amount, quality, and appropriateness of the parent/caregiver behaviors.

[b] Average for general impression ratings given above.

$$\hat{} \quad ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

PIE instruction concluded. No differences were found between the groups' parent-child interactional behaviors a year later at Posttest #2.

The PBRS (Mahoney) rates 12 parental behaviors including warmth, expressiveness, enjoyment, acceptance, sensitivity to child's interest, responsivity, effectiveness, directiveness, achievement orientation, pace, inventiveness, and verbal praise. Based on a principle axis factor analysis (using the SPSSPC) of these 12 variables for 462 observations of parent-child interaction from the EIRI studies, 3 factors were identified which together accounted for 61.8% of the variance. Factor 1, Affective Relationship with Child, included expressiveness toward child, enjoyment of interacting with child, and acceptance of child's behaviors. Factor 2, Orientation to Child's Interests and Behaviors, included sensitivity to child's interests, responsivity, and effectiveness of parent to engage child in play interaction. Factor 3, Performance Orientation, included achievement orientation, pace of parent's behaviors, and intensity and frequency of directives. Two variables, verbal praise and inventiveness, did not load high enough to be included in any factor. The three factors were compared for the two groups at Posttests #1, #2, and #4. Covariates were included in the analyses when their correlation with the outcome variables were high. No statistically significant differences between groups were found on any of the factors at any of the posttests (see Table 9.15).

Table 9.15

Comparison of Parental Behaviors as Coded by the PBRS (Mahoney) for the Parents in the Center-Based and Parent Involvement Groups for Posttests #1, #2, and #4

		Center-based only				Center-based + PIE						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES[^]
POSTTEST #1												
Affective relationship with child		3.0	(.6)		26	3.2	(.5)		21	1.49	.23	.32
Child orientation (responsivity to child)	1,2	2.9	(.7)	3.1	26	3.1	(.7)	3.0	21	.00	.96	.14
Performance orientation toward child	0,1,2	3.0	(.8)	3.0	26	3.1	(.8)	3.2	21	.80	.38	.13
POSTTEST #2												
Affective relation with child		2.9	(.6)		19	3.2	(.7)		16	.95	.34	.48
Child orientation (responsivity to child	1,2	2.8	(.8)	2.8	19	3.2	(.6)	3.2	16	2.12	.16	.49
Performance orientation toward child	0,1,2	3.0	(.8)	2.9	19	2.8	(.8)	2.8	16	.18	.68	-.25
POSTTEST #4												
Affective relationship with child		3.0	(.5)		24	3.1	(.5)		23	.84	.37	.19
Child orientation (responsivity to child)	1,2	3.3	(.9)	3.3	24	3.4	(.6)	3.3	23	.00	.97	.11
Performance Orientation toward child	0,1,2	2.6	(.9)	2.5	24	2.5	(.7)	2.6	23	.00	.97	-.11

[$] Covariates: 0 = Child age at pretest; 1 = Child Sex; 2 = Battelle Total Developmental Quotient at pretest

[^] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

Again, to investigate whether the PIE instruction influenced parent behaviors, the ratings of interactions for those parents who attended 11 or more of the PIE sessions were compared with the ratings of the parents in the center-based only group. Again, differences were found with the PCIS variables at Posttest #1, but not with the PBRS factors. As can be seen in Table 9.16, at Posttest #1, soon after

Table 9.16

Comparison of Posttest Measures of Parental Behaviors of Parents Who Attended 11 or More PIE Instruction Sessions, and Children of Parents in the Center-Based Only Group

		Center-based only				Attended 11 or more PIE Sessions						
Variable	Covariates[&]	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
POSTTEST #1												
Average Rating[♦]												
Amount		2.8	(.6)		26	2.6	(.5)		11	.37	.55	-.33
Quality		3.7	(.7)		26	4.3	(.6)		11	6.10	.02	.92
Appropriateness		3.9	(.6)		26	4.4	(.7)		11	5.70	.02	.83
Factors[$]												
Affective Relationship		3.0	(.6)		26	3.0	(.5)		11	.00	.97	.00
Child Orientation	0,1	2.9	(.7)	3.0	26	3.4	(.8)	3.3	11	1.05	.31	.68
Performance Orientation	0,1,2	3.0	(.8)	2.9	26	2.9	(.8)	3.0	11	.00	.96	-.13
POSTTEST #2												
Average Rating[♦]												
Amount		3.0	(.6)		19	2.9	(.8)		9	.17	.68	-.16
Quality		3.9	(.9)		19	4.3	(.7)		9	1.20	.29	.43
Appropriateness		4.1	(.9)		19	4.4	(.6)		9	1.32	.26	.33
Factors[$]												
Affective Relationship		2.9	(.6)		19	3.0	(.7)		8	.06	.81	.16
Child Orientation	0,1	2.8	(.8)	2.8	19	3.1	(.7)	3.1	8	.45	.51	.37
Performance Orientation	0,1,2	3.0	(.8)	2.9	19	2.6	(.7)	2.7	8	.45	.51	-.50
POSTTEST #4												
Factors[$]												
Affective Relationship		3.0	(.5)		24	3.1	(.6)		12	.33	.57	.19
Child Orientation	0,1	3.3	(.9)	3.3	24	3.2	(.6)	3.1	12	.47	.50	-.11
Performance Orientation	0,1,2	2.6	(.9)	2.5	24	2.4	(.8)	2.5	12	.04	.84	-.22

[#] Covariance adjusted means

[&] Covariates: 0 = Child Sex; 1 = Battelle Total Developmental Quotient at pretest; 2 = Child age at pretest

[^]
$$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[♦] Variables as coded by the PCIS

[$] Variables as coded by the PBRS

the sessions were completed, the parents who attended 11 or more sessions had statistically significantly higher scores than did the parents in the center-based only group on the average scores for quality and appropriateness of parenting behaviors. At Posttest #2, the quality and appropriateness scores were still higher for the high attending group, but the differences were not statistically significant.

In sum, the parent/child interaction findings are mixed depending on the rating system used. Over all the posttests, the rating system variables do not reflect differences in parent behaviors between the groups. However, using the PCIS coding system, statistically significant differences were found at Posttest #1, soon after the parent involvement program was completed, in both the group comparison (center-based vs. parent involvement) and the participation comparison (high attenders vs. center-based). The statistical significance of these differences did not remain at Posttest #2. Possibly the content of the PIE instruction helped the parents in their interaction with their children for a short period of time.

Conclusions

The primary purpose of this investigation was to ascertain the immediate and long-term effects on children with disabilities and their families of the addition of a parent involvement program to a center-based early intervention program. In this type of parent involvement program, the parents were trained to provide therapeutic intervention services for their children and to be more effective partners in the intervention process. The parent involvement sessions also offered the parents an opportunity to form support networks with each other and discuss concerns. This longitudinal study was methodologically sound with random assignment to treatment, treatment verification measures, multiple child and family measures, and "blind" assessment at all posttests. The two groups were well-matched on pretest demographic, child, and family measures. The analyses of intervening contextual variables revealed no significant group differences on intervening demographic or family measures, or additional services, thus controlling, for historical threats to the research findings. Child development effects, and family effects, are summarized and discussed below.

With so many different measures over a period of five years, it is difficult to portray the findings in a way which makes integration and understanding of the "big picture" possible. To assist with the integration of the large amount of data collected thus far, the graphical representation shown in Figure 9.1 has been created. The various measures of child and family functioning used in the five posttests are listed down the left-hand side. The entries in the center of the

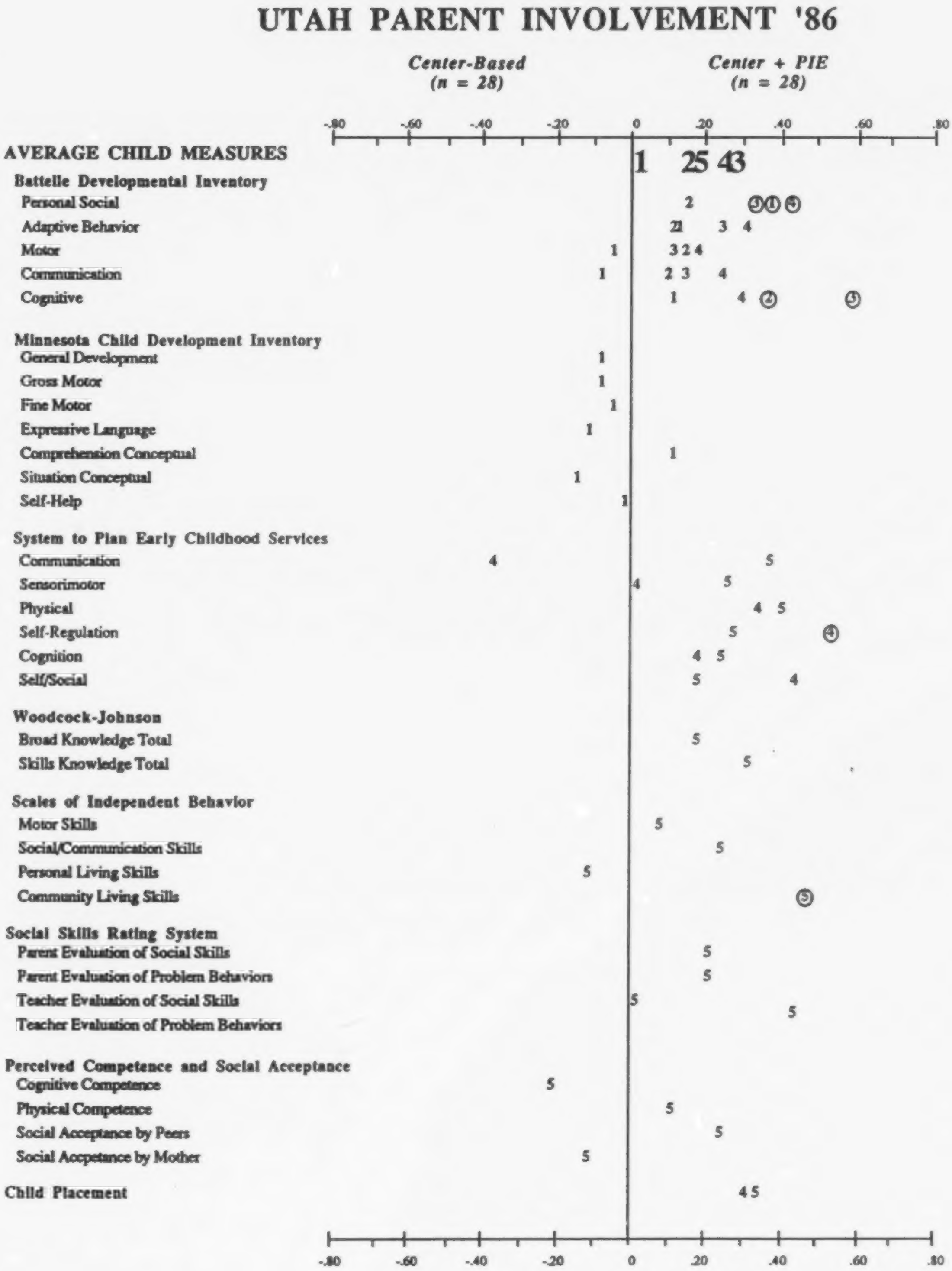

Figure 9.1. Graphical representation of results from child and family measures from all posttests for Utah Parent Involvement 1986 project.

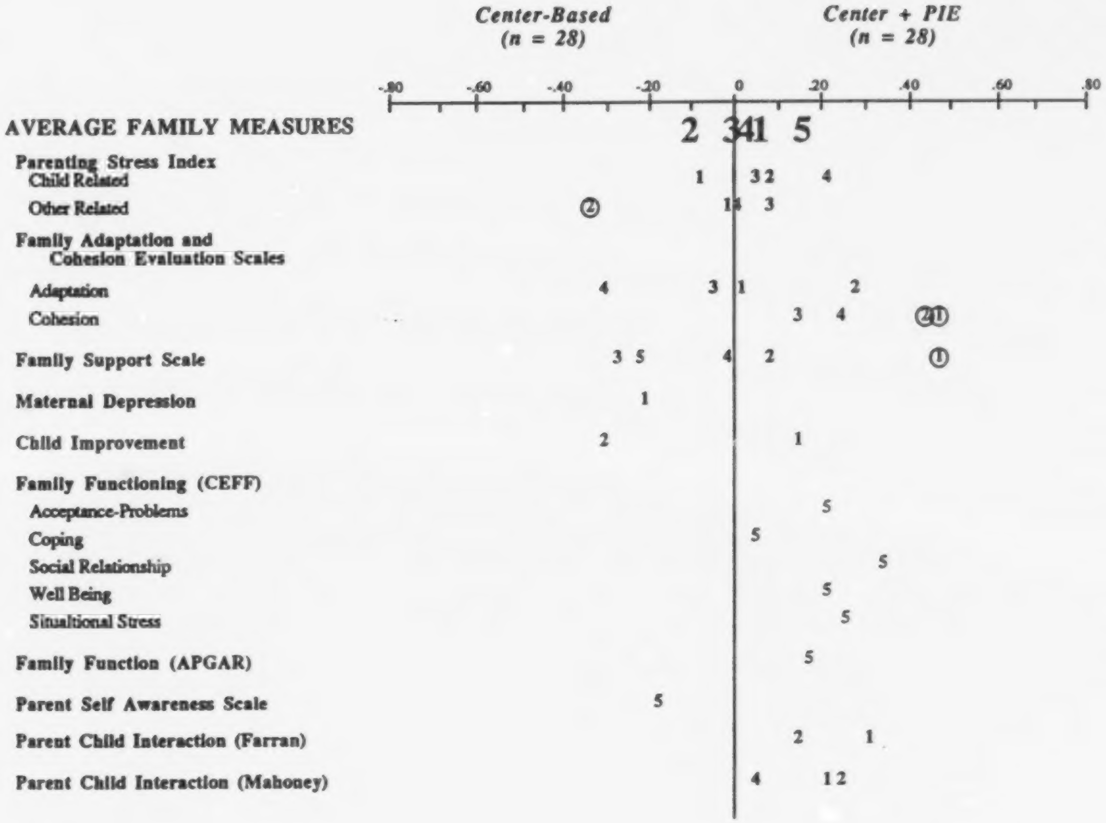

Figure 9.1. Graphical representation of results from child and family measures from all posttests for Utah Parent Involvement 1986 project.

figure represent the effect size for each measure at each time it was given (1, 2, 3, 4, or 5 for each respective posttest). All posttest scores are based on covariance adjusted means. Entries on the left side of the centerline indicate that the subjects in the center-based group did better, and entries on the right side of the line indicate that the center-based plus parent involvement group did better. Those that are statistically significant ($p \le .10$) are circled.

As can be seen, after the first posttest, almost all of the effect sizes for the child measures are positive even though only 7 of the 43 shown in this figure are statistically significant. The average effect size for all measures of child functioning is between .15 and .30. These data suggest that the addition of the parent involvement component had a small effect on measures of child functioning, but the results are hardly overwhelming. For family measures, the results are similar, but not even as strong as the small results for child measures. For four of the five posttests, the average effect size is less than .10 and two are negative. Admittedly, three of the four measures which are statistically significant favor the parent involvement group. However, 11 of the 36 measures favor the group without parent involvement even though only one of them is statistically significant.

The school data collected at Posttest #4 and #5 also possibly demonstrates benefits from the addition of the parent involvement component. The school placement of the two groups was somewhat different. At Posttest #4, of the children in the parent involvement group, fewer were eligible for special education services, more were in regular classrooms, and fewer were in self-contained classrooms than were the children in the center-based only group. The differences were not statistically significant, but the effect sizes ranged from .28 to .45. At Posttest #5, again, none of the differences reached the .10 level of significance, and the effect sizes were lower, ranging from .23 to .33, indicating less difference between the groups.

However, the findings from the high attender vs. center-based group comparison (the participation comparison) are troublesome. If the benefits came from participation in the parent involvement program, we would expect to find greater differences when the scores for the high attenders were compared to those of the center-based group. The differences found in these comparisons were similar to, but not greater than, the differences found with the parent involvement vs. center-based group comparisons.

It seems reasonable that more differences were found at Posttest #2, #3, and #4 than at Posttest #1 because time is needed to see the effect on the children of the ideas and practices learned by the parents in the instruction sessions, and the lack of significant difference at Posttest #5 might be explained by the change in instruments used, or a waning of the effect from the parent involvement four years earlier. Next year's analyses will provide further information. Yet, the evidence of a positive effect on child development from the parent involvement program was not unanimous. Although the development scores of the children in the parent involvement usually were higher, most of the differences were not statistically significant.

Finally, the most important question is whether the statistical differences found reflect any meaningful educational differences for these children. Often, statistically significant differences in actuality represent only a gain of a percentile or two on a developmental measure. Is a gain of a point or two educationally significant in terms of time and cost? In this study, the average BDI developmental quotient (raw score ÷ age equivalent score x 100) of 58 was almost three standard deviations below the mean and was near the first percentile. Even if one only considers those effect sizes that were statistically significant in favor of the parent involvement group, the mean scores for the children in the parent involvement group were raised less than two percentile points. This gain was the most significant gain found in the study, but yet seems like a small gain. However, gains with children with moderate to severe disabilities are notoriously difficult to achieve.

Effects on family functioning from the addition of the parent involvement component were also mixed. Overall, effects on family functioning were not evident. No differences were found on parenting stress between the groups at any of the posttests. The families in both groups across posttests continued to experience high child-related stress across the 4½ years. As was reported in the treatment verification section, a majority of the parents in the parent involvement group (who were tested at Posttest #2) reported less stress in their lives after the instruction, and better interaction with their children. These feelings, however, were not reflected by any changes in the PSI scale at Posttest #1 or #2. Family adaptability does not appear to have been influenced by the parent involvement program since no differences were found between the parent involvement and the center-based group at any posttest.

Likewise, overall, family cohesion and family support do not appear to have been influenced. The exception was that the parent involvement group reported significantly higher cohesion scores at Posttests #1 and #2, and social support scores at Posttest #1 soon after the PIE sessions concluded than did the center-based group. The perceived social support may have related directly to participating in the program with other parents and a professional and, therefore, was perceived immediately following the parent involvement program, but not a year later or thereafter. The cohesion findings are more difficult to interpret. The families in the parent involvement group reported lower cohesion scores at pretest, but reported higher cohesion mean scores (raw and adjusted means) at Posttests #1, #2, #3, and #4. The differences were statistically significant at Posttests #1 and #2. More investigation of this variable needs to be performed. Differences in some of parent interaction behaviors as measured by the parent-child observations were also found at Posttest #1, but not at later posttests, and may also have been related to the parents' participation in the parent involvement program.

The two groups varied statistically significantly on the teacher's evaluation of the parents' knowledge, support, and attendance at Posttest #4. The parents in the PIE group were judged to be more knowledgeable, supportive, and attend more of the educational meetings than did the parents in the center-based only group. These findings were not replicated at Posttest #5. Possibly the curriculum of the PIE program encouraged the parents to be more responsible and involved in their children's education; but the evidence is not compelling.

The question of whether the addition of this type of parent involvement component to an early intervention program increased the benefits for children or parents enough to warrant the cost or time involved needs to be addressed. Was the program cost-effective? The cost for the agency was minimal; most of the cost was borne by parents in terms of travel expenses and time. However, as research has demonstrated, the time of parents of children with disabilities is already taxed in caring for their children (Boyce & Barnett, 1991; Smith, 1986). Therefore, choosing programs that will involve parents' time must be chosen carefully.

In this study, some benefits for child development and family functioning were indicated. Were they sufficient enough to encourage the use of similar parent involvement component programs? Two replicative studies, the Utah Parent Involvement 1985 study (Boyce, 1990) and the Des Moines Public Schools Parent Involvement Study (Innocenti, 1990), using the same PIE instruction component, found minimal benefits. In all three studies, the parent involvement component was limited to a short period of time. Expecting extensive benefits from a limited program may be unrealistic. Clearly, more research needs to address whether a more extended program would result in greater benefits. Also, parent instruction programs using different curricula need to be investigated with sound methodological studies.

Parent instruction components are one of the most typical ways of involving parents in intervention, but there are other ways. Recent writings suggest that we should be more involved in providing support and empowering parents. These approaches also need to be tested empirically through methodologically sound research. Different types of parent involvement programs may have very different outcomes for parents and children. Therefore, care must be used not to generalize findings when it is not appropriate.

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